National Grid

The Narragansett Electric Company

2018 System Reliability Procurement Report

November 1, 2017

Submitted to:
Rhode Island Public Utilities Commission

RIPUC Docket No. 4756

Submitted by:

nationalgrid

Letter

Raquel Webster
Senior Counsel

November 1, 2017

BY HAND DELIVERY AND ELECTRONIC MAIL

Luly E. Massaro, Commission Clerk
Rhode Island Public Utilities Commission
89 Jefferson Boulevard
Warwick, RI 02888

RE: Docket 4756 - The Narragansett Electric Company, d/b/a National Grid
2018 System Reliability Procurement Report

Dear Ms. Massaro:

I have enclosed ten copies of National Grid's[1] proposed System Reliability Procurement Report for 2018 (the 2018 SRP Report). The 2018 SRP Report is Stipulation and Settlement between National Grid, the Rhode Island Division of Public Utilities and Carriers (Division), the Rhode Island Office of Energy Resources (OER), the Energy Efficiency Resources Management Council (EERMC), Acadia Center, and People's Power & Light (PP&L) (collectively, the Parties).

The Company submits this 2018 SRP Report pursuant to the System Reliability and Least Cost Procurement statute, R.I. Gen. Laws § 39-1-27.7 and the revised System Reliability Procurement Standards (the Standards), which the Rhode Island Public Utilities Commission (PUC) approved on June 7, 2011 in Docket 4202. The basis for least cost procurement of system reliability in Rhode Island is the Comprehensive Energy Conservation, Efficiency, and Affordability Act of 2006 (R.I. Gen. Laws § 39-2-1.2), which provides a unique opportunity for Rhode Island to identify and procure cost-effective customer-side resources with a focus on alternative solutions to the traditional supply options.

The 2018 SRP Report is consistent with the framework established in the Three-Year Energy Efficiency Procurement Plan (Three-Year Plan) filed in Docket 4684 to integrate the analysis of non-wires alternatives (NWA) into the Company's planning functions by using analytical tools to evaluate the costs and benefits of traditional and NWA solutions, and to identify system needs for which a NWA is the preferred solution.

In the 2018 SRP Report, the Company proposes a number of efforts aimed at developing and promoting aspects of the Rhode Island System Data Portal. In addition to the traditional review and screening process for NWAs, the Company proposes to create a distribution system loading constraint map and the initial version of a distributed generation-focused map. These maps will identify the following: heavily-utilized feeders, substations that are ready for distributed generation; substations that require 3VO, and feeders that require significant

[1] The Narragansett Electric Company d/b/a National Grid (National Grid or Company).

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additional investment to host any additional capacity. Additionally, the Company proposes to issue two requests for proposals from third party developers for the purchase of NWA resources. The Company also proposes to work with the Parties to begin creating a set of location-based avoided costs to enhance the cost effectiveness analysis for each project.

To promote this work and existing related state and Company programs, the Company proposes a marketing and engagement plan. This marketing and engagement plan will target distributed energy resource providers and end-use customers to engage the market in procuring load relief. Under this plan, the Company would not be the sole administrator for procuring load relief.

The Company is also proposing to discontinue the Load Curtailment Pilot (Pilot) at the end of 2017. The Pilot, which the PUC approved in Docket 4296, is located in Tiverton and Little Compton and tested the use of targeted energy efficiency and load curtailment by customers (or demand response) as a means to manage local distribution capacity requirements during peak periods.

The request for proposal that the Company proposed as part of the 2017 SRP Report in Docket 4655 was completed in early 2017; however, the project originating from this request for proposal could not be implemented in 2017 because of delays. Therefore, the Company has proposed a separate NWA project in 2018 called the Little Compton Battery Storage Project (Project). The Project consists of the installation of a vendor-owned battery storage unit in Little Compton, which through contract with the Company, will provide up to four hours of 250kW of peak load relief. Successful implementation of the Project could further defer the Tiverton substation upgrade (targeted in the Pilot) by four years.

Finally, for the first time, the Company is proposing a System Reliability Procurement incentive mechanism (the SRP incentive). The SRP incentive is comprised of a combination of action-based and savings-based incentives. The action-based incentives are designed to promote the availability of distribution grid information for distributed energy resource solution providers, customers, and other stakeholders. The action based incentives allow the Company to earn up to 6% of the SRP budget associated with the applicable actions if they are completed on time.

The savings-based incentives are designed to promote additional NWA projects, which benefit the Company and customers and which are administered by the Company and third-party developers. Projects eligible for the savings-based incentives will split the net benefits associated with the projects with 80% going to back to customers and 20% going to the Company.

The Company is requesting that the PUC approve a total 2018 SRP budget of $399,300. As in past years, the Company is proposing to roll the SRP customer funding request into the existing Energy Efficiency Program (EEP) charge instead of including these funds as a separate line item on customers' bills. The total additional funding needed for the Pilot in 2018 is $0.00000 per kWh. With the addition of the SRP funding, if approved, the total EEP charge

would be $0.01000 per kWh. As with the Energy Efficiency funds, actual revenues will be reconciled against actual expenses at the end of the year, and any difference will be credited or charged to customers in 2019.

The EERMC has approved the 2018 SRP Report, which complies with the Least Cost Procurement statute and the Standards. Accordingly, the Company respectfully requests that the PUC approve the 2018 SRP Report.

Thank you for your attention to this filing. If you have any questions, please contact me at 781-907-2121.

Sincerely,

Raquel Webster

cc: Jon Hagopian, Esq.
Steve Scialabba, Division

2018 SRP Plan

SYSTEM RELIABILITY PROCUREMENT

2018 REPORT

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2018 SYSTEM RELIABILITY PROCUREMENT REPORT

Introduction

The Narragansett Electric Company's d/b/a National Grid (National Grid or Company) is pleased to submit this annual System Reliability Procurement Report (SRP Report) for 2018 to the Rhode Island Public Utilities Commission (PUC). The SRP Report has been developed by National Grid in collaboration with the Energy Efficiency Collaborative (the Collaborative).[1]

This SRP Report is submitted in accordance with the Least Cost Procurement law, R.I. Gen. Laws § 39-1-27.7, the basis for which is the Comprehensive Energy Conservation, Efficiency, and Affordability Act of 2006 (as amended in May 2010),[2] and the PUC's revised "System Reliability Procurement Standards," approved by the PUC in Docket No. 4443 (SRP Standards).[3] This Plan is being jointly submitted as a Stipulation and Settlement (Settlement) between the Rhode Island Division of Public Utilities and Carriers (Division), the Energy Efficiency and Resource Management Council (EERMC), Acadia Center, People's Power & Light, the Rhode Island Office of Energy Resources (OER), and National Grid (together, the Parties), and addresses a range of topics discussed by members of the Collaborative regarding the Company's SRP Report for calendar year 2018.

Section 2.1(D) of the SRP Standards requires that the Company identify transmission or distribution (T&D) projects that meet certain screening criteria for potential non-wires

[1] Members of the Collaborative presently include the Company, the Division, TEC-RI, People's Power & Light, and Acadia Center, along with participation from the OER Office, several EERMC members, and representatives from the EERMC's Consulting Team.

[2] The Comprehensive Energy Conservation, Efficiency and Affordability Act of 2006 (the 2006 Act) provides the statutory framework for least cost procurement, including system reliability in the State of Rhode Island. The 2006 Act provided a unique opportunity for Rhode Island to identify and procure cost-effective customer-side and distributed resources with a focus on alternative solutions to the traditional supply and infrastructure options. Overtime, these alternative solutions may deliver savings to customers by deferring or avoiding distribution system investment, and improving overall system reliability.

[3] The Least Cost Procurement law, R.I. Gen. Laws § 39-1-27.7, requires standards and guidelines for "system reliability" that include the "procurement of energy supply from diverse sources," including, but not limited to, renewable energy resources, distributed generation, including but not limited to, renewable resources and cost-effective combined heat and power systems, and demand response designed to, among other things, provide local system reliability benefits through load control or using on-site generating capability. On June 10, 2014, in Docket 4443, the PUC unanimously approved revised standards for system reliability, finding that the standards were consistent with the policies and provisions of R.I. Gen. Laws 39-1-27.7.1(e)(4),(f) and R.I. Gen. Laws § 39-1-27.7.3.

alternative (NWA) solutions that reduce, avoid, or defer traditional T&D wires solutions. NWAs are targeted actions by customers or the utility that promote the deferral of a specific Company investment in transmission or distribution infrastructure. Section 2.1 (I) of the SRP Standards further require the Company to submit, by November 1 of each year, an SRP Report that includes, among other information, a summary of where NWAs were considered, identification of projects where NWAs were selected as a preferred solution, an implementation and funding plan for selected NWA projects, recommendations for demonstrating distribution or transmission projects for which the Company will use selected NWA reliability and capacity strategies, and the status of any previously approved NWA projects.

National Grid seeks approval of this 2018 SRP Report in accordance with the guidelines set forth in Section 2.1 of the SRP Standards.

Summary of the Company's Proposal

This 2018 SRP Report includes a review of the infrastructure projects studied for NWA potential, a discussion of the work the Company is doing to create the Rhode Island System Data Portal (Portal) and associated marketing and engagement plan, updates on the load curtailment pilot (Pilot) in Tiverton and Little Compton, a new NWA project proposal and an incentive proposal.

As part of this 2018 SRP Report, the Company is proposing to discontinue the Pilot, which the company proposed in the 2012 System Reliability Procurement Report – Supplement (2012 SRP Report) and which the PUC approved in Docket 4296.

The new NWA project proposed in this Report is called the Little Compton Battery Storage Project (Project), which includes a battery storage system that will be installed in Little Compton, RI and which is capable of providing 1 MWh of energy storage at a level of 250 kW of continuous peak load relief in the areas of Tiverton and Little Compton between the hours of 3:30pm and 7:30pm during the months of June through September. Although the Project is located in the same footprint as the Pilot and is intended to further defer the $2.9 Million substation upgrade detailed in the Pilot proposal in Docket 4296, the Project is a separate effort from the Pilot.

As part of the effort of developing the Portal, the Company is also proposing a parallel customer engagement effort to promote the Portal to potential distributed energy resource (DER) solution providers. This effort would aim to increase industry knowledge of the Portal and incentives available through existing Company and state programs for conservation, peak load relief, and renewable energy projects in highly-utilized areas.

The Company estimates that approximately $399,300 in incremental costs will be required in 2018 to implement the projects and initiatives detailed in this Report. The Company is requesting recovery for these funds and a four-year commitment to the Project funding, subject to additional budget funding requests to be made in the 2019, 2020 and 2021 SRP Reports.

Consideration of NWAs in System Planning

All transmission and distribution needs continue to be screened for NWA feasibility when the projects are initiated. A project is initiated when a future need is identified. The timing of that future need can vary greatly from just a few years to up to twenty years. Once a future need is identified, the Company conducts a detailed analysis intended to conceptualize and compare potential wires and non-wires solutions. If the Company determines that an NWA solution is feasible, it is fully developed and then proposed through the next SRP Report. If a wires solution is the best option, that project is then fully developed and incorporated into the Company's Electric Infrastructure, Safety and Reliability Plan (ISR Plan).[4]

To determine whether an NWA is feasible, the Company first screens transmission and distribution projects against the criteria listed in Section 2.1(D) of the SRP Standards, which are aligned with the Company's internal planning document. Thirty-six distribution projects were initiated between April 1, 2016 and March 31, 2017, and all were determined to be ineligible for NWA consideration. A table detailing the projects reviewed and the reasons for their NWA ineligibility is provided in Appendix 4.

The Company has included volt-VAR optimization and conservation voltage reduction (VVO/CVR) projects in the upcoming Infrastructure Safety and Reliability (ISR) Plan. Although the main components of the VVO/CVR projects are capacitors, they are controlled in a non-traditional way that emulates an NWA effort. These projects deliver energy at a voltage level that results in a peak-time efficiency for customers, saving them an estimated 3% on their energy charges. This technology also manages reactive power flows, which reduce system loss inefficiencies and in turn, peak power flows. Finally,

[4] Notably, newly initiated projects comprise only part of the budgets and assets that are included in the Company's Electric ISR Plan, which includes all projects that will be part of the Company's capital investment portfolio in a given year, which typically includes multi-year projects that may already be in progress. Also, projects that ultimately do not pass NWA screening in a given year may not always be included in the ISR budget for that year due to a variety of constraints. Instead, these projects will be proposed as the ISR budgets allow in future years. Therefore, it is possible that there may be projects and budgets related to load growth in the ISR that are not included in the screening conducted for this Report. Once a solution is chosen for either a transmission or distribution project, it is not screened for NWA feasibility again.

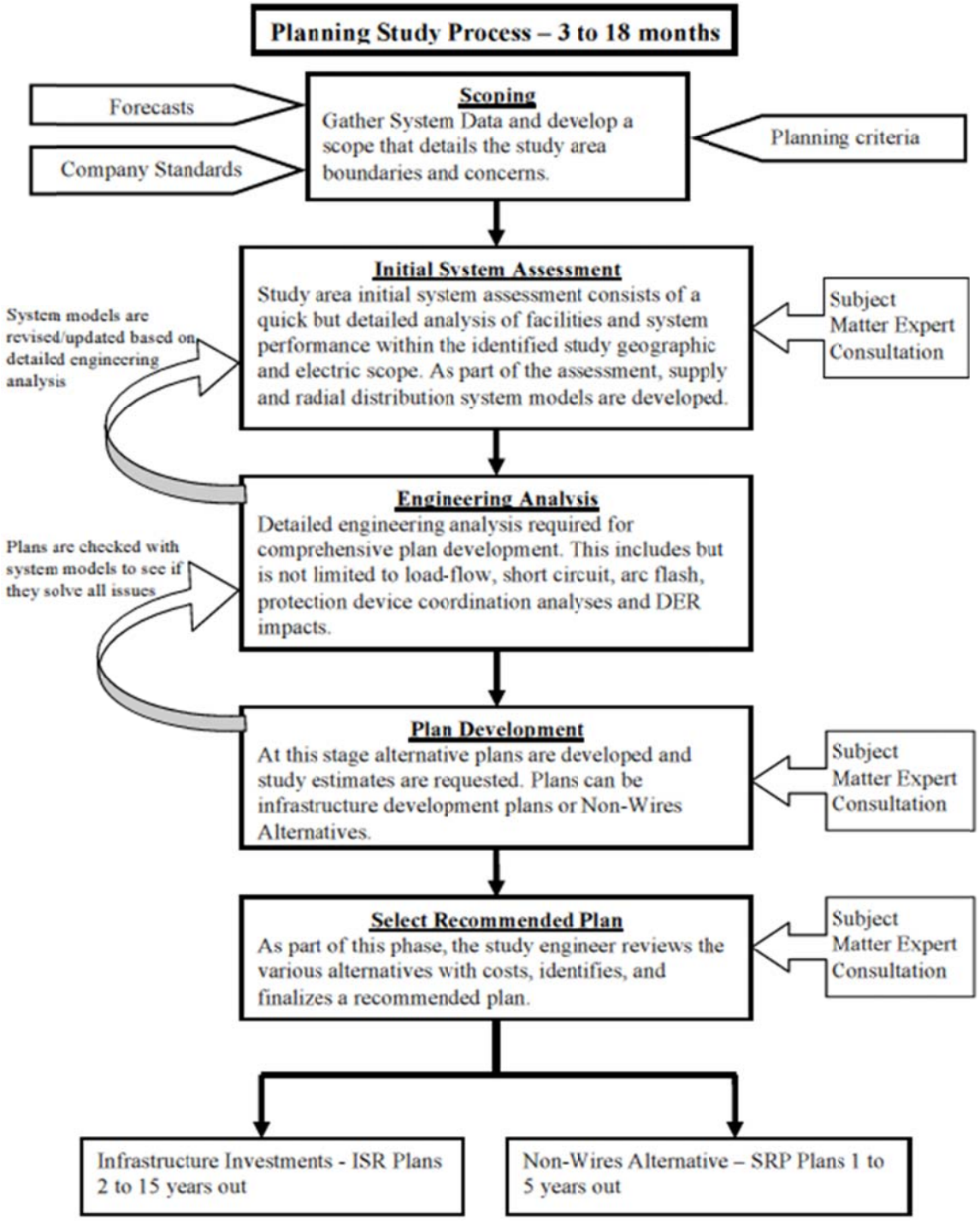
this technology provides the Company with more granular information on distribution asset performance and operations that may improve future system efficiency without the need for a specific NWA project.

The Company is also continuing to progress its NWA consideration in its distribution area studies, including the Central Rhode Island East (CRIE) Area Study in February 2017 and the Providence Area Study - Implementation Plan in May 2017. The Company did not identify any NWA opportunities in the CRIE study. The Providence study found contingency issues that will undergo further NWA review at a future date. Due to the sequencing of the Providence study's recommendations, it is reasonable for the Company to defer the contingency infrastructure projects until technologies such as energy storage mature or perhaps decrease in unit pricing. At that time, another NWA review can be performed to defer or potentially eliminate the traditional wires projects.

Table 1: Providence Study – Preliminary Energy Storage Analysis

Station/ Circuit	Contingency Load Relief	Contingency Duration	Traditional Wires Option	Traditional Wires Option	Energy Storage	Energy Storage Cost
Clarkson Street 13F5	3.9 MVA	12 Hours	Geneva New Feeder	$2.0M	6MW/36MWh	$16.2M
Clarkson Street 13F4	2.3 MVA	12 Hours	See above	See above	3MW/15MWh	$9.0M
Total				**$2.0M**		**$25.2M**

The figure below is a Distribution Planning Study Process flowchart, which outlines the major steps and study-based inputs in the overall area study process. The Company plans to continue analyzing its current NWA screening and development processes to determine how NWAs might be best considered as both complete and partial solutions.


Planning Study Process – 3 to 18 months
Forecasts
Company Standards
Scoping
Gather System Data and develop a scope that details the study area boundaries and concerns.
Planning criteria
Initial System Assessment
Study area initial system assessment consists of a quick but detailed analysis of facilities and system performance within the identified study geographic and electric scope. As part of the assessment, supply and radial distribution system models are developed.
Subject Matter Expert Consultation
System models are revised/updated based on detailed engineering analysis
Engineering Analysis
Detailed engineering analysis required for comprehensive plan development. This includes but is not limited to load-flow, short circuit, arc flash, protection device coordination analyses and DER impacts.
Plans are checked with system models to see if they solve all issues
Plan Development
At this stage alternative plans are developed and study estimates are requested. Plans can be infrastructure development plans or Non-Wires Alternatives.
Subject Matter Expert Consultation
Select Recommended Plan
As part of this phase, the study engineer reviews the various alternatives with costs, identifies, and finalizes a recommended plan.
Subject Matter Expert Consultation
Infrastructure Investments - ISR Plans 2 to 15 years out
Non-Wires Alternative – SRP Plans 1 to 5 years out

Rhode Island System Data Portal & Heat Map Resources

This section proposes initiatives for 2018 intended to provide more information to stakeholders, customers, and third parties regarding the status of the Company's distribution grid. In 2018, the Company proposes to begin work on the Portal as the means for making available capacity constraint maps, hosting maps, avoided costs for distributed energy resources (DERs), and other relevant distribution grid information. The Company plans to complete an initial version of the Portal by June 30, 2018. The proposed Portal attributes are:

1. A distribution system loading constraint map (i.e. heat map) that identifies, at a minimum, the extent to which each feeder on the Company's distribution system is loaded to 80% or more of its summer normal rating. In addition, the map will identify locations where additional capacity exists and, therefore, can accommodate beneficial electrification such as electric vehicles (EVs) and high efficiency heat pumps. The map will provide information for at least 10 years into the future.

2. The initial version of a distributed generation (DG)-focused map that identifies:
    a. Any substations that are DG-ready (i.e. ground fault detection or 3VO has already been installed);
    b. The list of substations at which 3VO will be installed and the schedule for the installation;
    c. The list of substations on the Company's distribution system that require either the addition or replacement of a larger substation transformer to host additional DG. The map, or set of maps, should provide information for at least 10 years into the future. The Company will complete this attribute by September 30, 2018. The Company will add a hosting capacity function once adequate software is available and the Company properly vets the software. The Company and the Parties will agree on a timeline for implementing hosting capacity by September 30, 2018. This work may be part of the 2019 SRP plan.

3. The Company will begin the process of producing a set of location-based avoided costs for each substation on the Company's distribution system. This would include all pertinent avoided costs included in the Rhode Island cost-effectiveness framework to the extent that they are available. One option would be to include location-based avoided distribution costs calculated using marginal cost-of-service studies using the methodology to be developed as required by the Commissions 4600 Guidance Document. The Company will work with the Parties in 2018 to complete a stakeholder review process of this work with documented next steps by August 31, 2018.

The Company will also issue, by December 31, 2018, at least two new requests for proposals (RFPs) from third-party developers for the purchase of a set of NWA resources. The decision on where to locate the NWAs will be based on the information provided in the Portal, as well as the Northwest Rhode Island study. The location-based avoided costs referenced in item (3) above would be used as the maximum amount payable for NWA resources. Any contracts to procure NWAs would have to be approved by the Rhode Island PUC as required for all non-tariff contracts.

The Company has already begun an effort to identify highly utilized areas in northwest Rhode Island through circuit modeling, data gathering, and advanced distributed generation modeling. As an example, an RFP issued in in 2018 could address the load reduction requirements outlined in the following technical summary:

Table 2: Sample Technical Summary

Circuit	Substation	General Geographic Location	Main Streets	Peak MVA Reduction Target	Peak Time	Time Period to Achieve 80% Loading
34F1	Chopmist	Foster & NW Scituate	Rt 6, Central Pike, Rockland Road	1.4	16:00	13:00-20:00
38F1	Putnam Pike	Greenville	Putnam Pike, Sawmill Road	2.1	17:00	13:00-21:00[5]

The figures below outline the calculated load shape curve in 2027 for the 34F1 and 38F1 circuits and the required output from area DG (in MVA) to bring the peak loads down to 80% of the Summer Normal Rating.

[5] 2016 circuit loading was modeled with growth rates through 2027 from the current Company forecast to provide a 10 year horizon.

Figure 1: 34F1 Load Shape Curve

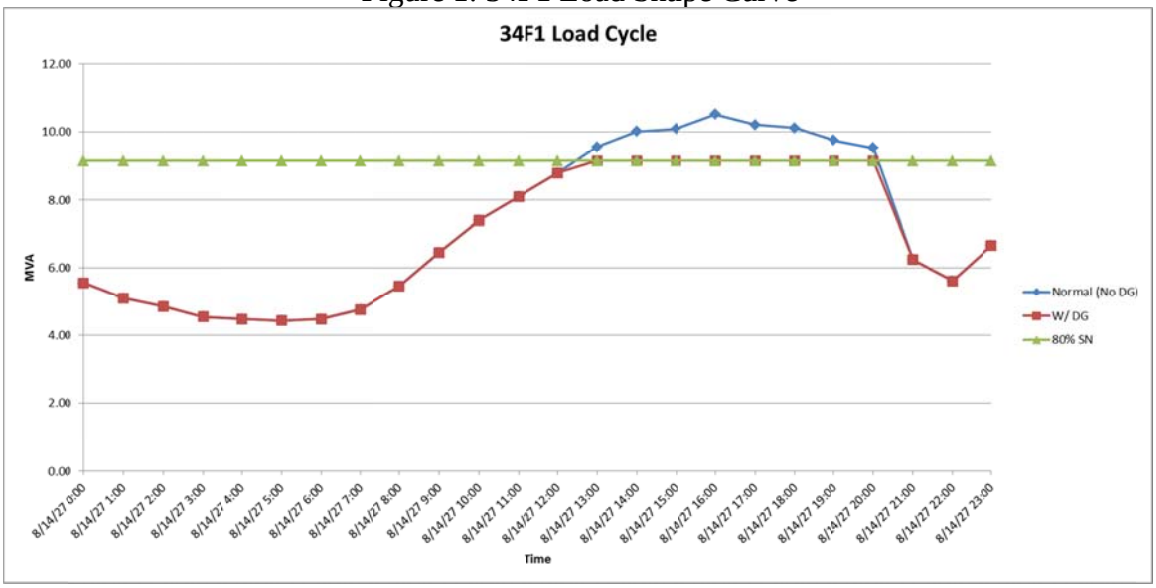


Figure 2: 34F1 Required DG Contribution for 80% Loading

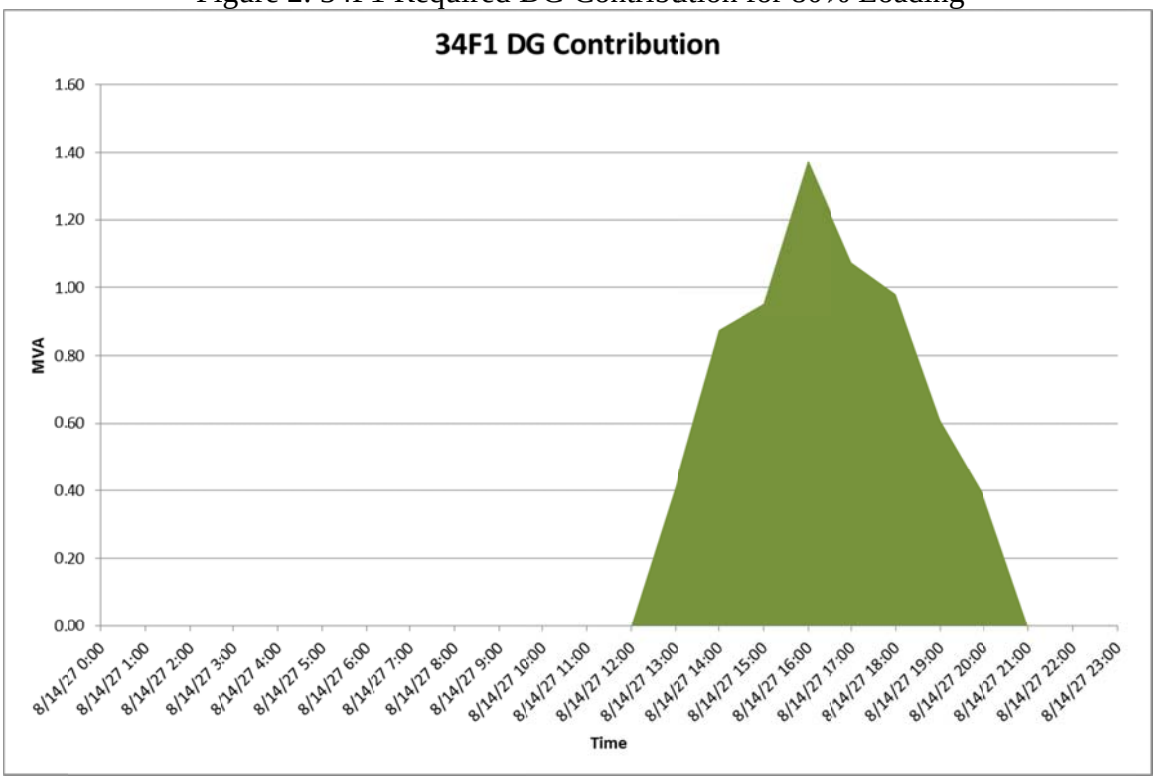


Figure 3: 38F1 Load Shape Curve

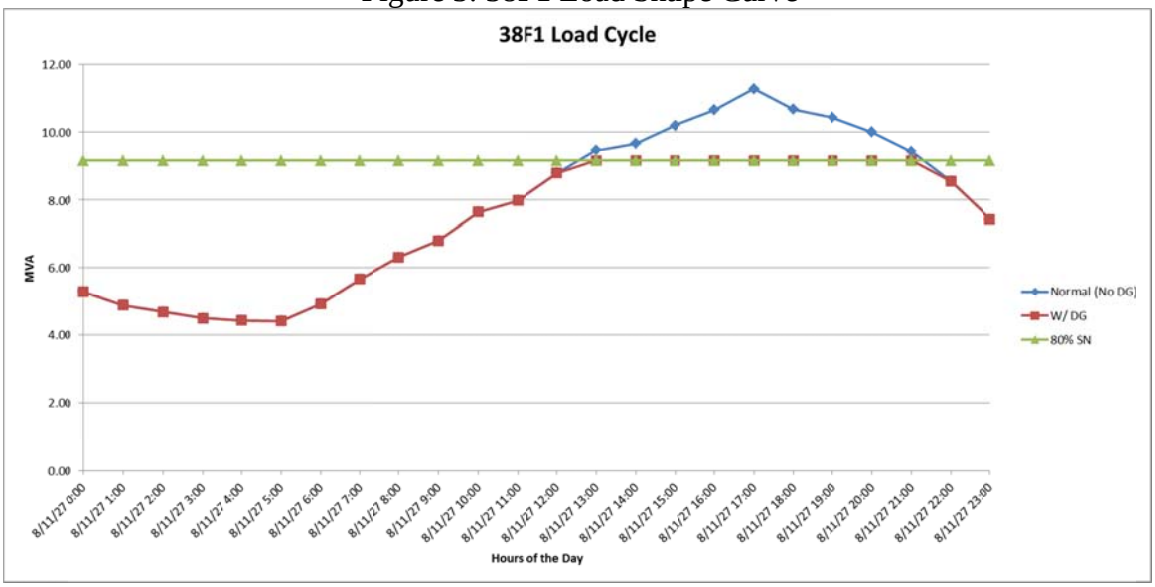
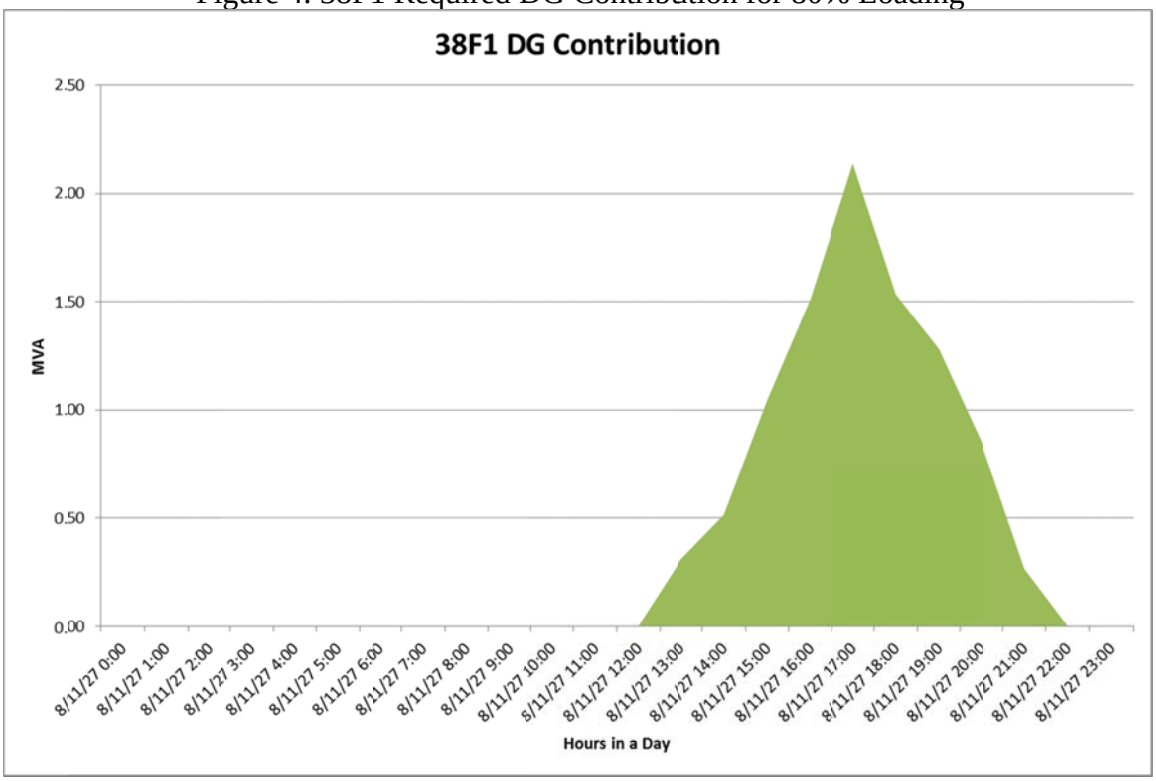


Figure 4: 38F1 Required DG Contribution for 80% Loading



DER solution providers would propose solutions for either the entire or a portion of the peak MW reduction target. The Company recognizes the need for performance metrics to verify peak reduction, so verification of many small proposals may prove unmanageable. The Company expects a reasonable and manageable mix of large and small proposals, but will include as part of its review criteria the proposals' ability to show actual reductions at the breakers and substation transformers. The Company will explore the limits of reasonable and manageable during this effort. The Company expects that a three-year performance period will provide sufficient confidence of load reduction for reliability purposes.

Figure 5: Chopmist Substation Circuit Map

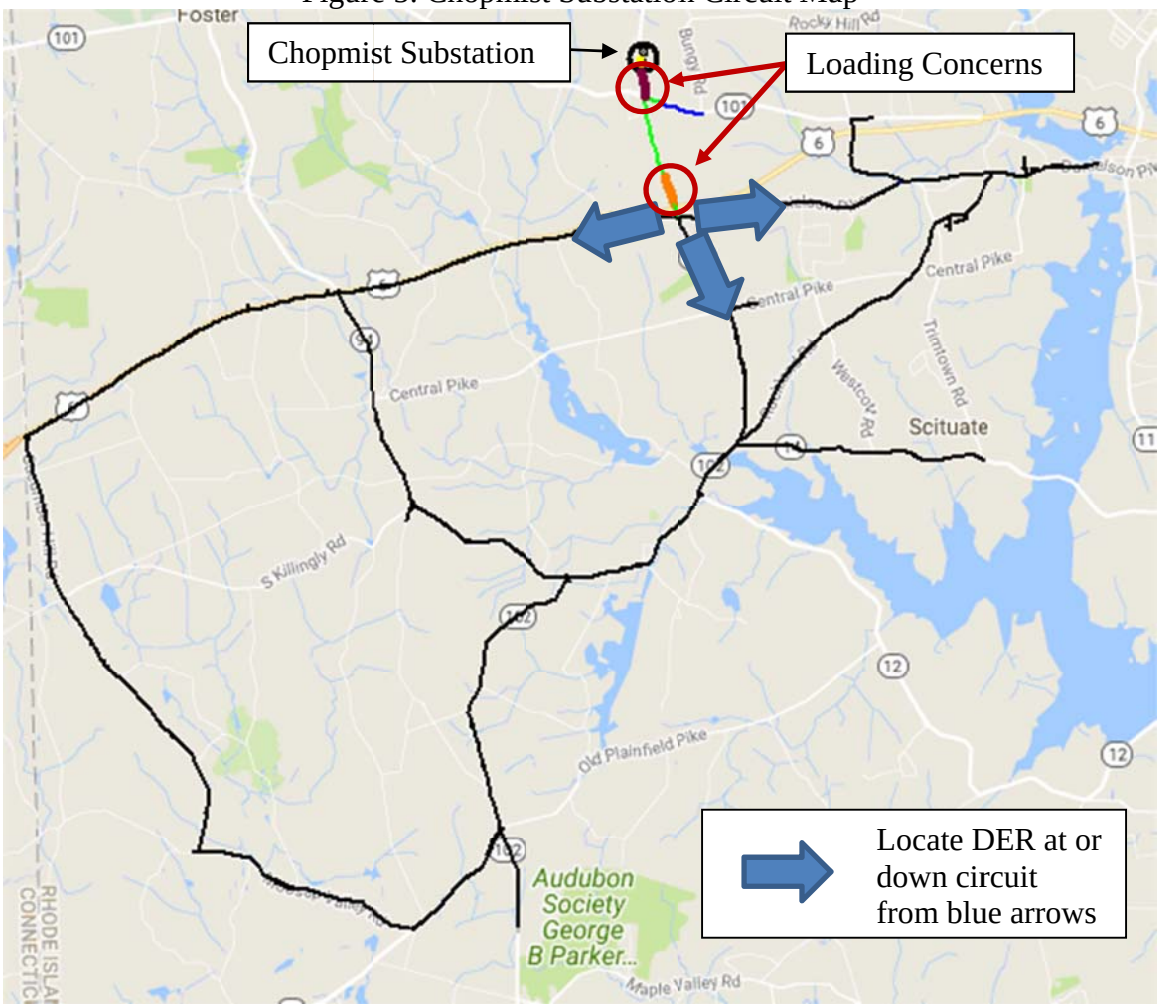
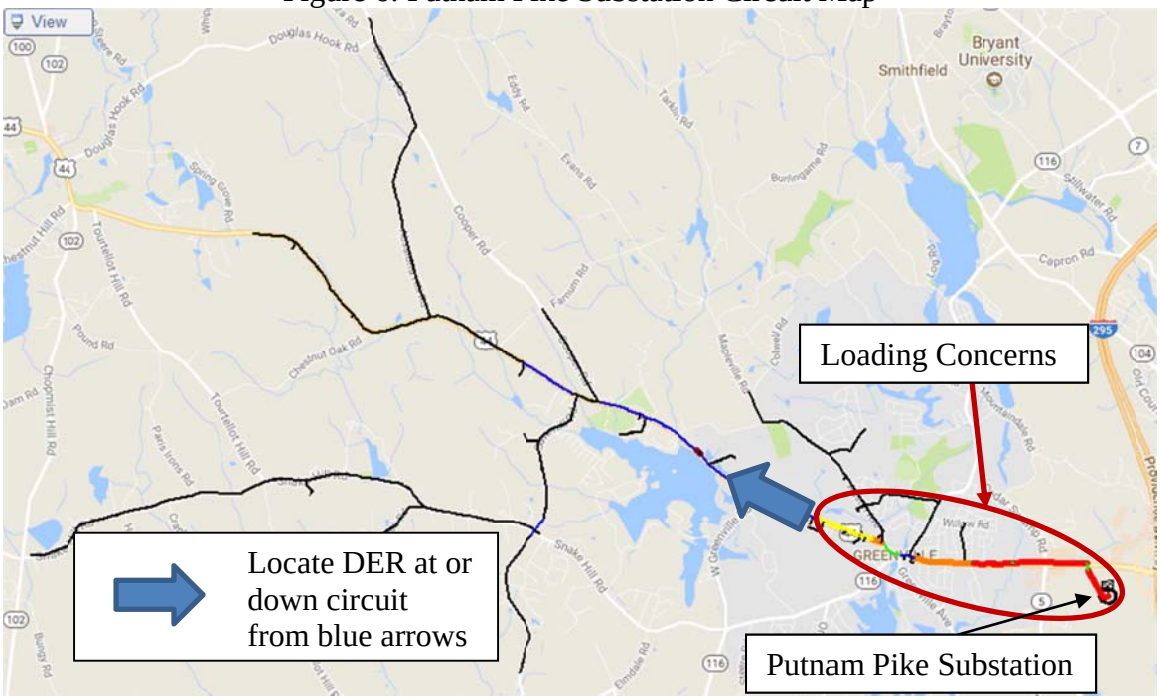


Figure 6: Putnam Pike Substation Circuit Map



System Data Portal & Heat Map Resources Funding Plan

The Company proposes a budget of $80,000 to support the initial development of the above activities. This would include system based resources and employee time to develop the heat map concept resources related to this work.

Market Engagement with NWAs

The Parties agree that there may be additional opportunities for installations of technologies that reduce peak load outside of the Company's consideration and proposal of cost-effective NWA projects. To nurture these inherent opportunities with the work the Company is doing on the Portal, and to encourage DER solution providers to support the strategic deployment of these solutions to benefit constrained areas, the Company proposes to develop and deploy a marketing and engagement plan in 2018.

This marketing and engagement plan would promote the Portal and heat map resources described in the previous section as they become available. The marketing and engagement plan would also promote incentives already available through existing Company and state programs (e.g. net metering, Re-growth, and the ConnectedSolutions DR program).

By March 31, 2018, the Company would develop and share with the Parties the initial marketing and engagement plan with proposed tracking mechanisms to capture its effectiveness. The Company will work with the Parties over the next two months to finalize the tracking mechanisms. The campaign would then go live by May 31, 2018 to support the deployment of resources identified in item (1) of the previous section by June 30, 2018.

Customer Engagement Funding Plan

As the Company has limited funds within the 2018 SRP Report, the Company proposes a budget of $124,800 to support this initiative in 2018. The Company would use $80,000 to support the initial creation and dissemination of marketing materials and tracking mechanisms. The Company would use $44,800 to support administrative costs associated with managing the development of the materials within the Company and with vendors, as well as to develop tracking and evaluation processes to determine the initiative's effectiveness.

Tiverton NWA Pilot

As noted in the Summary of the Company's Proposal section of this Report, the Company is proposing to discontinue the Pilot at the end of 2017. The following sections include the most updated information about the Pilot since the 2017 SRP Report was filed in Docket 4655. This information is included here both in keeping with the reporting seen in past SRP Reports and to help clarify the reasons the Company is not proposing to extend the Pilot beyond 2017.

Forecasted Load Growth in the Tiverton Area

The Company's distribution system serves close to 500,000 electric customers in 38 cities and towns in Rhode Island. The residential class accounts for approximately 41% of the Company's total Rhode Island load, the commercial class accounts for approximately 49%, and the industrial class accounts for approximately 10%. The Tiverton and Little Compton annual weather-adjusted summer peaks are expected to increase at average annual growth rates of 0.5% and 0.6% respectively for the next 10 years, which are both greater rates than the statewide average annual growth of 0.3%. The forecasted load growth rates for cities and towns in Rhode Island are shown in Appendix 1.

The data captured for the summer of 2016 shows a 33F4 circuit peak of 102% of the normal rating of the equipment. The extreme summer forecast for this circuit in 2016 was 97%. Although the summer of 2016 is not considered extreme from a state perspective, it appears that the Tiverton area did experience higher-than-expected loads during this time. This data indicates that weather variability will be a complex factor in future non-wires alternative analyses. In this particular case, the cool 2014 and 2015 summers may have masked underlying load growth.

The DERs and cool summers successfully deferred the wires alternative from its original 2014 in-service date. The Little Compton Battery Storage Project, described in greater detail below, is proposed to provide an estimated four years of additional deferral of the substation upgrade. National Grid otherwise intends to start the engineering and design of the wires solution in 2019 (ISR Plan fiscal year 2020) with construction in 2020 (ISR Plan fiscal year 2021).

For informational purposes, the entire Company US Electric System Peak Load Forecast is included in Appendix 1.

Implementation

The following sections provide details on the implementation of the Pilot's most recently completed year of activities and a progress report on the current year's activities to date. For more information regarding the implementation activities in previous years, please review past SRP Reports.

2016 Summary

The Pilot's focus in 2016 was on varying the marketing tactics from those used in the past in order to refresh the message and engage new participants. The principle change in the plan from prior years was the deployment of additional outreach in both Pilot communities as part of the Rhode Island Energy Challenge campaign, which was added to the comprehensive campaign conducted for the Pilot. With the discontinuation of plug device incentives, the Company also allocated additional funds to the marketing campaign in order to extend it and increase participation toward the end of 2016.

In 2016, the Company launched a marketing campaign that ran from mid-March through December. The campaign continued with its aggressive nature and messaging of previous years, while also introducing the company's new "Life On The Grid" branding theme. The 2016 campaign included a series of direct mail and email newsletters that contained information designed to educate customers about the reasons for the Pilot, attempts to reduce electricity consumption, and the benefits of the Pilot to the entire community. The newsletters were created to deliver different messages to both Pilot Participants (those previously engaged in any level of Pilot energy-saving activity) and Non-Participants. The separation of customer types was also carried out in the direct mail communications. The direct mail newsletter, post cards, and emails included articles that highlighted the numbers of neighbors who had implemented one or more Pilot efficiency actions, as well as the economic savings enjoyed by Rhode Island customers from energy efficiency.

Once again, the Company hired RAM Marketing to complete outbound telemarketing calls to Non-Participant customers using a Company-created script of DemandLink Pilot information. The outbound calling included two separate attempts to contact each working phone number of Non-Participants. This effort was designed to give customers the opportunity to ask questions in real-time of a representative who was knowledgeable

about the Pilot. RAM representatives were also informed of the new offers within the pilot, including the enhanced rebates for Heat Pump Water Heaters and frequently asked questions were also added to the script.

Rhode Island Energy Challenge was also leveraged again to establish a personalized community focus. They focused primarily on promoting free home energy audits along with the additional program benefits (i.e. Wi-Fi thermostats and Smart Plugs, Window AC Rebates).

As was the case in previous years, all marketing components in 2016 have directed customers to make contact via the online email form, centralized toll-free phone number or email to learn more about the program and sign up. RAM Marketing received these calls and emails, and then pre-qualified interested customers and sent the resulting leads to RISE Engineering for scheduling. Pre-qualification consists of verifying the customer's address and account on the Pilot area list, ascertaining the existence of broadband internet/Wi-Fi and either central or window AC units, and determining customer interest in each rebate.

Table 3: Penetration of Interested Pilot Leads 2016

Pilot Year (through month)	Leads Generated	Customer Penetration*
2012 (December)	209	4.2%
2013 (December)	1061	21.3%
2014 (December)	655	13.2%
2015 (December)	730	14.7%
2016 (December)	428	8.6%
Total through August 12, 2015	**3,083**	**62.0%**

**** Based on total of 4970 available Pilot customer phone numbers***

In 2016, nearly 40% fewer customers accepted Pilot program offerings. As previously noted, the campaign's preliminary results reflect that a comparable number of leads were generated by August 2016, which is similar to the number of leads in August of 2015. Therefore, the Company's efforts to reach customers in the Pilot area continue to be effective. However, the number of qualified leads for measures other than the EnergyWise home energy assessments was much lower than in 2015 during the same time period. The Company believes that this is due in part to the fact that the Pilot reaches a saturation point with customers who respond to telemarketing.

The Company triggered eighteen demand response (DR) events between July and early-September. The 2016 Annual Evaluation Report delivered by Opinion Dynamics

Corporation (ODC) provided an analysis of the DR impacts of the 2016 events. A summary of this analysis is included in the Evaluation section of this Report.[6]

The Company estimates that by the end of 2016, it achieved approximately 87kW of incremental load relief toward the 1MW goal. This represents 51% of the 2016 summer demand savings target of 170kW set in the 2016 SRP Report and reflects all savings impact updates made in this SRP Report. The Company also estimates that through 2016 the Pilot cumulatively achieved 77% of the 1MW target. Please see Table S-7, Appendix 3 for more information regarding the Pilot's progress toward its kW targets for each year.

Although this information is used to gauge the progress of the Pilot and to plan future activities, these numbers represent estimates only. The success of the Pilot in recruiting enough sustained load relief to defer the wires project will be determined through the final evaluation report from Opinion Dynamics Corporation in 2018.

2017 Summary to Date

In 2017, the Company proposed a plan to create the remaining peak savings in order to achieve its 1MW goal. The plan entailed decreasing the focus on the targeted EE and DR efforts and increasing focus on a market-based solution procured through an RFP process. However, the incentives offered in 2016 continued to be marketed and made available for customers.

The 2017 campaign included a kickoff newsletter and series of direct mail that contained information designed to increase customer understanding of how demand response events work and fully comprehending the benefits of the Pilot's EE and DR measures to the entire community. As in previous years, the communications were crafted to deliver different messages to both Pilot Participants (those previously engaged in any level of Pilot energy-saving activity) and Non-Participants.

Additionally, in August 2017, the Company explored native ads on Facebook that targeted customers in Little Compton and Tiverton directly. These ads featured the DemandLink messaging and were designed to create more awareness to support direct mail outreach.

As was the case in previous years, all marketing components in 2017 have directed customers to make contact via the online email form, centralized toll-free phone number or email to learn more about the program and sign up. RAM Marketing received these calls and emails, and then pre-qualified interested customers and sent the resulting leads

[6] The 2016 Annual Evaluation Report is included in this Report as Appendix 4.

to RISE Engineering for scheduling. Pre-qualification consists of verifying the customer's address and account on the Pilot area list, ascertaining the existence of broadband internet/Wi-Fi and either central or window AC units, and determining customer interest in each rebate.

To date, outreach to Pilot customers in 2017 has produced 179 pre-qualified leads for the enhanced DemandLink incentives compared with 215 leads for the same period in 2016, and 435 leads in 2015.

Table 4: Penetration of Interested Pilot Leads 2017

Pilot Year (through month)	Leads Generated	Customer Penetration*
2012 (December)	209	4.2%
2013 (December)	1061	21.3%
2014 (December)	655	13.2%
2015 (December)	730	14.7%
2016 (December)	428	8.6%
2017 (August)	179	3.6%
Total through August 17, 2017	**3257**	**65.6%**

**** Based on total of 4970 available Pilot customer phone numbers***

The number of qualified leads for measures other than the EnergyWise home energy assessments was much lower than in previous years during the same time period. The Company believes that this is due in part to the fact that the Pilot reaches a saturation point with customers who respond to telemarketing.

To close out the remainder of this year, the company will make another aggressive push to create as much participation as possible. This push will include a second telemarketing pass, direct mail, social media, and email marketing.

Twenty-three DR events were initiated from July through September 2017.[7] Approximately half of these events were triggered by a forecasted need on the feeder, while the rest were triggered based on weather conditions. Preliminary event data from the Pilot's demand response management system (DRMS) provider, Whisker Labs, indicates that approximately 60-65% of thermostats are fully participating in the event. Six to eight percent (8-10%) of thermostats opt out while the event is in progress, and approximately 27% are opting out either prior to the event set points going live or were not in cooling mode when the event was triggered.

[7] There were no events triggered in June 2017 due to mild weather conditions.

In late 2016, the Company began a solicitation process to procure a peak-shaving solution from the market. The Request for Proposals (RFP) was released in November, and the process concluded in January with a successful bid for a battery storage project. The Company worked diligently with the chosen vendor throughout 2016 to position the battery for service by the end of the year. However, due to delays in equipment selection affecting the interconnection process, the project's timeline has been pushed out into 2018. In recognition of the timeline associated with the Pilot and the value of implementing this energy storage project, the Company is proposing to split this effort out of the Pilot as its own NWA project proposal. Details of this new proposal are given in later sections of this Report.

Based on year-to-date participation and the changes to the market-procured solution noted above, the Company projects that by the end of 2017, it will have achieved approximately 21% of its planned incremental summer kW target of 330kW, including all updates to savings impacts and program changes. 250kW of that 330kW is associated with the market-based solution. The Company projects to achieve approximately 86% of its non-market-based solution planning target. The chart below, which is broken down by source, illustrates the Company's projections for 2017 kW savings.[8]

Table 5: 2017 Pilot kW Savings

	2017 Planning Assumption	Current 2017 Projection	% of Planning Assumption
DR Potential kW	9	1	11%
EE Installed kW	83	68	82%
Market Solution kW	250	0	0%
Total	170	96	56%

Evaluation

The Company continues to work with Opinion Dynamics Corporation (ODC) on the evaluation of the Pilot. The major evaluation objectives for 2017 were (1) a participation analysis, (2) an EnergyWise impact analysis to assess the incremental energy efficiency impact of 2012-2016, (2) an impact analysis of demand response events during the summer of 2016, (3) a demand response event follow-up survey, (4) a marketing effectiveness survey, and (5) developing an evaluation plan for 2018.

The participation analysis found that 155 customers in the pilot area completed home energy assessments through EnergyWise in 2016. While this represents a 42% decrease

[8] It should be noted that the savings projected for 2016 include adjustments to the demand response and smart plug energy efficiency to reflect evaluation results of smart plug usage as well as reduced demand response impacts of the Wi-Fi thermostats, further reducing the projected savings down from what was planned. Without these adjustments, DR projections would be at 31%, EE at 71% and total Pilot at 62%.

from 2015, it is still higher than pre-pilot participation levels. The main barrier to participation in this program continues to be finding the time to be home for the audit. Participation was also lower for the DemandLink Thermostat Program offering. In 2016, 12 new participants enrolled, bringing the total for the pilot-to-date to 269 participants. The analysis found that the most common barrier to participation in the DemandLink program was customers' perceptions that they do not use air conditioning enough to benefit from the program. Customers were also uncomfortable with someone else controlling their thermostat. Participation in the Window AC Rebate and Recycling Program and the Heat Pump Water Heater (HPWH) Program increased over previous years, with customers receiving 27 window AC rebates, recycling 37 units, and 17 HPWH rebates.

The EnergyWise impact analysis estimated the extent to which the Pilot created incremental energy efficiency savings in the pilot area that would not have otherwise been achieved. The results used the existing "take rate[9]" from 2012-2015 and applied it to gross load impacts from the installation of EnergyWise Program measures. The results show that, to date, the Pilot has achieved incremental summer peak load savings totaling 128.5 kW, in a range of 118.7 to 138.2 kW, from EnergyWise energy efficiency measures.

The demand response impact analysis calculated the peak demand savings resulting from the 18 demand response events called between July 6 and September 9, 2016. The results, which are detailed in the chart below, were derived from a mixture of day matching, modeling, thermostat logs and weather data.

Table 6: 2016 Demand Response Event Impacts

	Thermostat Impact		Program Impact	
	Runtime Reduction	kW	# of Participating Thermostats	kW
Central AC	10.9%	0.40	115	46
Window AC	N/A	0.045	.04	0.018

Fewer central AC thermostats were included in the 2016 analysis than in 2015 due to the fact that log files were unavailable for 31% of thermostats during July and for 17% of thermostats during August and September. The analysis found that, on average, 13 log files per event showed only zero values, meaning the AC was not running and there was no load to drop. In addition, 11 thermostats per event on average experienced event failure, meaning they did not receive a signal, and an average of 15 thermostats opted out per event.

[9] For definition and details, please see Appendix 3.

Similar to prior years, the program also experienced difficulty with the functionality and connectivity of window AC thermostats and plug devices. This was exacerbated by the fact that none of the 78 log files received for the July events (events 1 through 9) contained any data and the demand response savings were therefore assumed to be zero. For all August and September events, 68% of all window AC thermostats contained no data. In total, only one of the 158 window AC thermostats (0.6%) showed plug usage data for all events, yet opted out of each one. Therefore, the number of participating thermostats is less than one. The Company ceased enrollment of participants with window AC in the DemandLink program during 2016 due to continued connectivity issues.

The demand response event follow-up analysis provided helpful insight into customer awareness with the DemandLink Program. ODC conducted an event follow-up survey between August 30th and September 1st, following the SRP demand response event called on August 29th. The analysis found that participants with central AC are highly aware of the various elements of the DemandLink Program while awareness of window AC participants is much lower. Window AC participants that were aware of events were more likely to use at least one plug device with their window AC unit. The analysis also found that 65% or participants recalled the Company calling at least one event over the summer and only 8% of participants thought that National Grid had called too many events. Almost all participants (95%) plan to participate in future events.

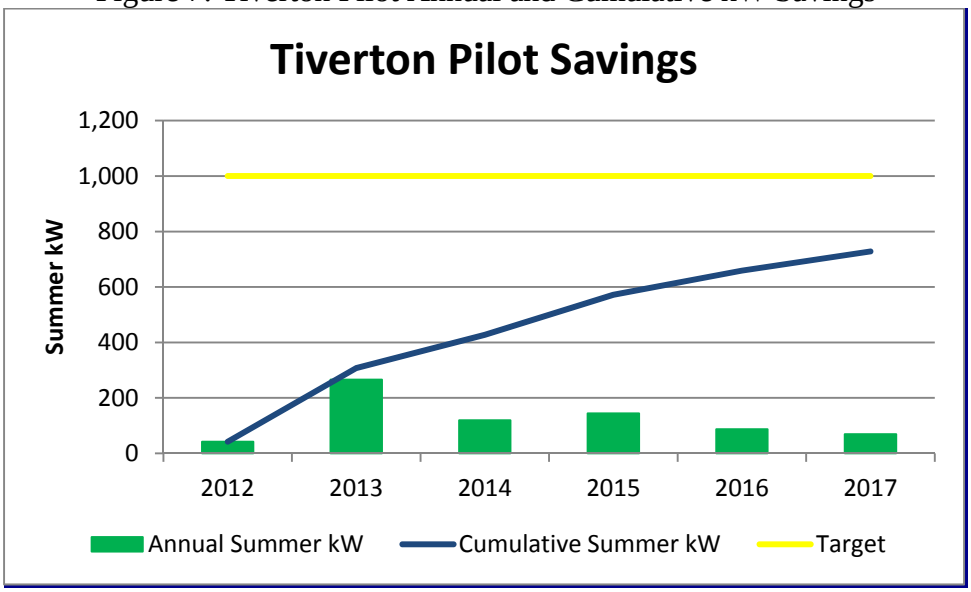
The marketing effectiveness survey found that 88% of EnergyWise participants and 93% of DemandLink participants remembered receiving program information in 2016. For non-participants, 53% remembered receiving information about it 2016. For both participants and non-participants, marketing materials received by mail had the most impact.

In September 2017, the Company created an evaluation plan and associated budget estimate for 2018. The main evaluation task for 2018 is to determine the overall impact and effectiveness of the pilot from 2012-2017 in meeting the 1 MW reduction goal. The Company expects that the final evaluation report by June 2018.

2018 Pilot Proposal

The Company proposes to discontinue the pilot at the end of 2017. A number of factors contribute to this recommendation. First, although the Pilot has been successful in creating peak load relief each year, the amount of peak load relief achieved has consistently decreased. This is illustrated in the figure below.

Figure 7: Tiverton Pilot Annual and Cumulative kW Savings



Although EE and DR are believed to be some of the least expensive methods for creating load relief, encouraging such deep customer participation in the same area year after year has yielded fewer incremental participants in each year. This means that the amount of savings achieved for each marketing dollar spent decreases as traditional methods are exhausted and more invasive and expensive methods are needed. The Company has employed a number of efforts to encourage customers in the Pilot area to participate in its EE and DR offerings over the last five years as illustrated in the table below.

Table 7: Summary of Marketing Pilot Marketing

Year	Marketing Tactics Employed
2012	• Emails and mail to targeted lists of high-energy-users • "Save Money Save Energy" theme
2013	• Emails, mail, newsletters to all pilot customers • Outbound calling to all pilot customers • Social media ads • "Save Money Save Energy" theme
2014	• Emails, mail, newsletters to all pilot customers • Outbound calling to all pilot customers • Social media ads • "Save Money Save Energy" and "Help the Community" Themes • Different messaging to prior participants vs non-participants • Door-to-door outreach for small business customers
2015	• Emails, mail, newsletters to all pilot customers • Outbound calling to all pilot customers • Social media ads • "Save Money Save Energy" and "Help the Community" Themes • Different messaging to prior participants vs non-participants

	• Co-marketing with the SRP Solar DG Pilot (OER)
2016	• Emails, mail, newsletters to all pilot customers • Outbound calling to all pilot customers • Social media ads • "Save Money Save Energy" and "Help the Community" Themes • Different messaging to prior participants vs non-participants • Coordination with RI Energy Challenge outreach • Home Energy Report Ads
2017	• Emails, mail, newsletters to all pilot customers • Outbound calling to all pilot customers • Social media ads • "Save Money Save Energy" and "Help the Community" Themes • Different messaging to prior participants vs non-participants

The Company has also made an effort to incorporate cost effective technologies beyond EE and DR through its market solicitation approved in the 2017 SRP Report. Although the Company still proposes to include this technology in the Pilot footprint, one of the lessons learned through this effort is that more time needs to be built into such installations. This was also demonstrated by the OER's SRP Solar DG Pilot, which took more than one summer to fully implement. Since the original intent of the Pilot was to test EE and DR, the Company believes that the best course of action is to discontinue the Pilot as planned, and test new opportunities as new projects, whether they will be in the Pilot area or in other NWA areas.

Pilot Funding Plan

For 2018, the Company is proposing to fund only the final evaluation activities associated with the 2017 implementation period, estimated to be $85,000. This includes the analysis of EE and DR impacts for the 2017 year, as well as costs associated with the final evaluation report.

Pilot Benefit Cost Analysis

The benefit cost calculations for this pilot have been completed using the Total Resource Cost test.[10] Figures for pilot years 2012 through 2017 have been updated to reflect actual results, year-end projections and data from the EE impact evaluation, as applicable.

[10]For a detailed description of the cost and benefits associated with the cost-effectiveness framework, see 2012 SRP Report - Supplement, February 1, 2012, Docket 4296.

Table S-2
System Reliability Procurement - Tiverton/Little Compton
Summary of Cost Effectiveness ($000)

	2012	2013	2014	2015	2016	2017	Overall
Benefits	**$179.0**	**$1,325.4**	**$1,033.3**	**$1,281.1**	**$687.7**	**$668.5**	**$5,175.0**
Focused Energy Efficiency Benefits[1]	$90.2	$1,015.1	$716.7	$1,024.8	$435.0	$497.6	$3,779.4
SRP Energy Efficiency Benefits[2]	$88.8	$310.4	$136.8	$78.0	$88.1	$11.3	$713.3
Demand Reduction Benefits[3]	$0.0	$0.0	$5.6	$6.8	$5.3	$11.4	$29.0
Deferral Benefits[4]	$0.0	$0.0	$174.2	$171.5	$159.4	$148.2	$653.3
Costs	**$133.4**	**$672.4**	**$569.3**	**$1,029.4**	**$611.1**	**$1,122.6**	**$4,138.3**
Focused Energy Efficiency Costs[5]	$46.6	$331.1	$195.8	$529.3	$280.1	$804.0	$2,186.9
System Reliability Procurement Costs[6,7]	$86.8	$341.3	$373.5	$500.2	$331.0	$318.6	$1,951.5
Benefit/Cost Ratio	**1.34**	**1.97**	**1.81**	**1.24**	**1.13**	**0.60**	**1.25**

Notes:
(1) Focused EE benefits in each year include the NPV (over the life of those measures) of all TRC benefits associated with EE measures installed in that year that are being focused to the Tiverton/Little Compton area.
(2) SRP EE benefits include all TRC benefits associated with EE measures installed in each year that would not have been installed as part of the statewide EE programs.
(3) DR benefits represent the energy and capacity benefits associated with the demand reduction events projected to occur in each year.
(4) Deferral benefits are the net present value benefits associated with deferring the wires project (substation upgrade) for a given year in $2014.
(5) EE costs include PP&A, Marketing, STAT, Incentives, Evaluation and Participant Costs associated with statewide levels of EE that have been focused to the Tiverton/Little Compton area. For the purposes of this analysis, they are derived from the planned ¢/Lifetime kWh in Attachment 5, Table E-5 of each year's EEPP in the SF EnergyWise and Small Business Direct Install programs. These are the programs through which measures in this SRP pilot will be offered.
(6) SRP costs represent the SRPP budget which is separate from the statewide EEPP budget, as well as SRP participant costs. The SRP budget includes PP&A, Marketing, Incentives, STAT and Evaluation.
(7) All costs and benefits are in $current year except for deferral benefits.
(8) 2012-2016 numbers have been updated to reflect year end data. 2017 numbers reflect year end projections.

The Pilot remains cost effective over its life, with a benefit/cost ratio of 1.25 as shown in Table S-2 above. Each year is also cost effective on its own except for 2017. The biggest impact on the 2017 BC ratio is in the RFP solution not coming to fruition.

All costs and benefits in this analysis are in current year dollars, meaning that the avoided costs are inflated for each year. The savings associated with this Pilot are categorized in the same way as the benefits. These savings are shown in Table S-4 of Appendix 2. As projected, the Pilot has created over $5 million in benefits in the Tiverton/Little Compton area over its six-year lifetime. For each $1 invested, this Pilot created $1.25 of economic benefits over the lifetime of the six-year investment.

Coordination with SRP Solar DG Pilot

In 2016, the Company supported the impact evaluation of the OER's SRP Solar DG pilot as well as the impact that the Pilot's marketing had on participation in the solar initiatives. An estimated 64 customers from the Pilot area participated in the Solarize portion of the Solar DG pilot. Additionally, as a requirement of the Solarize program, all of the participating customers completed a no-cost home energy assessment. The results of the OER's comprehensive evaluation of its SRP Solar DG pilot are expected to help inform the Company's consideration of solar and possibly other renewables, as an NWA tool.

With the Solar DG Pilot's highest demand occurring in the 4-8pm period of time, the Company concludes that solar did not provide significant load relief for the Pilot during the summer of 2017. Further data on solar performance will be gathered for summer 2018. Solar's contribution to load relief going forward will depend on several factors, including whether the movement of the distribution circuit peak in Tiverton/Little Compton to later in the day is a multi-year trend or a one-year occurrence.

Little Compton Battery Storage Project

Project Proposal

For 2018, the Company proposes the Little Compton Battery Storage Project (Project), which will include a battery storage system to be installed in Little Compton, RI to provide peak load relief. The storage system will be capable of providing 250 kW of continuous peak load relief in the areas of Tiverton and Little Compton between the hours of 3:30pm and 7:30pm during the months of June through September.

The Project would provide load relief in the same geographical footprint as the Pilot. The RFP was previously approved within the 2017 SRP Report in Docket 4655 as part of the Pilot. The Company completed the RFP in early 2017, resulting in a battery storage project as the winning bid. However, during the process of implementation, the project was delayed and could not be installed by the summer of 2017 as planned. As a result of this delay and for the reasons described in the 2018 Pilot Proposal section of this report, the Company is proposing the Project as an independent effort in 2018.

The battery vendor proposes to engineer, procure, construct, and install a 1 MWh advanced battery storage solution (the "Battery") designed to deliver 250 kW of peak load relief for 4 hours that would be located at the Little Compton Town Transfer Station, at the intersection of Colebrook Road and Amy Hart Path in Little Compton, RI. The Town of Little Compton has provided a letter of support to the vendor for this project proposal.

The vendor's proposal is to site, own and operate the energy storage asset, and enter into a services contract to provide the required load reduction benefit to National Grid during the summers of 2018 through 2021. The Company proposes that the Project timeline span these four years, which is the maximum amount of time the substation upgrade can be deferred with this solution, based on the current peak load forecast. The Company requests commitment for this Project for that timeframe in order to enable a cost effective agreement with the vendor for peak load relief services. However, the Company will make budget funding requests in each individual year, following the precedent set by the Pilot.

Project Funding Plan

The Company estimates that it will require $109,500 to implement the Project in 2018 and for each of the three years following. $87,500 is associated with the actual implementation of the solution, (i.e. payments to the vendor,) and $22,000 is associated with the management of that vendor in both implementing the solution and monitoring and evaluating it. Similar funding requests for the second, third, and fourth years of this Project will be proposed in the 2019, 2020 and 2021 SRP Reports.

Evaluation

The Company is proposing to evaluate the energy savings that the Project provides through a metering and control system, and the data made available through it provided by the vendor. The Company proposes that the calculation of 'energy savings' (batteries have inherent losses, but the anticipation is that the battery will charge during lower wholesale price periods and discharge at higher wholesale priced hours, with the 'savings' being the difference in these prices) shall be measured by the amount of power output provided during peak period windows over time by the battery storage system per calendar year.

Benefit Cost Analysis

The Project's costs and savings were evaluated using the Rhode Island (RI) Test to determine whether the benefits of implementing the Project outweigh the costs.

The Company estimates that a four-year deferral will have approximately $647,599 of localized distribution investment savings for customers.[11] This value is determined by calculating the amount of revenue requirement that will not be collected if the investment is deferred for those four years. This benefit was inserted into the RI Test model as a replacement for the regional distribution benefit in the avoided costs.

The remaining benefits were estimated using the RI Test model, assuming the 250kW reduction for four hours at a time, for an estimated twenty days per year. The number of days was estimated based on the average number of days demand response events were called in the Pilot each year for 2015 through 2017. This benefit cost analysis differs slightly from the analysis used for the Pilot in that it uses the benefits outlined in the RI Test. The Pilot benefit-cost analysis used the Total Resource Cost test. The Project's benefit cost analysis is also consistent with the language in the SRP Standards section 2.3.F.

[11]The substation upgrade was originally planned for 2014, so all benefits for this project were inflated to $2018 to match the proposed NWA Project budget.

The Project budget of $438,000 represents the costs to procure load reduction services through the battery storage unit for a four-hour period for a contract of four years, as well as some Company resources to support the development and maintenance of this contract and load reduction events as necessary.

The following table illustrates the benefit-cost analysis of the Project using the RI Test. With a positive BC Ratio, this project represents a cost effective for customers.

Table 8: Little Compton Battery Storage Project Benefit-Cost Summary

Little Compton Battery Storage Project	
Total Cost	$438,000
Total Benefits	$721,326
Net Benefits	$283,326
BC Ratio	1.65

SRP Incentive Mechanism Proposal

The Company and the Parties have agreed on a proposal comprised of a combination of action-based and savings-based metrics for the Company to earn incentives on work completed through SRP in 2018.

Action-Based SRP Incentives

The Company will earn an incentive equal to a portion of the 2018 SRP budget for completing certain actions, as described in this Report, by the milestone date stated in this Report. The actions and associated percentages of the 2018 SRP budget the Company can earn are:

Table 9: Summary of Action-Based SRP Incentives

Action	**% of 2018 SRP Budget**
Distribution System Loading Map	1%
DG Focused Map	1%
Avoided Cost Stakeholder Review Process	1%
Marketing & Engagement Plan	1%
Issue RFPs for NWA Resources	2%

Accordingly, if the Company were to implement all of the initiatives referenced above by the dates defined in this Report, it would earn a maximum of 6% of the 2018 SRP budget. The 2018 SRP budget would be defined as all of the costs required to implement the SRP initiatives described above. This SRP budget would be determined in the SRP Report, prior to the commencement of 2018 SRP activities. The amount of SRP incentives earned would be based on this initial budget, not on the actual dollars spent to implement the initiatives.

Savings-Based SRP Incentives

The Company will also be able to earn savings-based incentives for those DERs that are installed as a result of the SRP initiatives described above. The Company will be obligated to demonstrate that DERs were installed as a result of the SRP initiatives. This demonstration would require: 1) an affidavit from the DER provider that Company marketing influenced their decision to site, and 2) confirmation that the DER was installed in the current year of the SRP plan (i.e. calendar year 2018). In future SRP plans (2019 and on), there will be a third requirement: measured output at the feeder during peak hours showing the specific DER's contribution to peak load reduction.

In order for the Company to earn savings-based incentives on them, the DERs will have to be deemed cost-effective according to the Rhode Island cost-effectiveness framework established in the Commission's Docket 4600 Guidance Document. DERs that are statutory such as net metering and renewable energy growth (REG) are assumed to be cost effective as per the PUC's initial guidance in the Docket 4600 process.

Savings associated with programs for which the Company earns an incentive from other sources (e.g., REG) will not be included in the Company's savings-based incentive calculation.

The savings-based incentive will allow the Company to earn a share of the net benefits of the installed DERs that meet the demonstration criteria described above. Net benefits will be defined using the Utility Cost test, which includes only the "power sector" costs and benefits in the Rhode Island cost-effectiveness framework. Participant and societal costs and benefits will not be included for the purpose of determining the shared savings incentive amount. The Utility Cost test provides the clearest indication of the extent to which DERs reduce costs for all customers. Net benefits will include the location-based avoided distribution costs, if applicable, prepared by the Company, as described above.

In 2018, the net benefits of the DERs will be shared by allocating 20% to the Company and 80% to customers. The savings-based incentive mechanism would be applied to the net benefits of the Project proposed in this Report, as well as any projects installed and marketed as a result of the other SRP initiatives proposed in this report, to the extent they meet the criteria outlined in this section. The proposed incentive mechanism, assuming the Company meets the threshold requirements for earning the incentive, is illustrated below in the calculation of the savings-based incentive associated with the Project proposed in this Report.

Project Net Benefits:[12]	$283,326
Company Incentive Share:	20%
Company Incentive:	$56,666

The Company has not included a budget line item for incentives in this SRP Report. Any incentive earned by the Company will be calculated and included as part of the 2019 SRP Report funding request.

2018 System Reliability Procurement Funding Request

The Company proposes to fund the projects and initiatives included in this SRP Report through the energy efficiency charge on customers' bills, as has been done in the past. The tables below illustrate the breakdown of the Company's funding request and the proposed customer charge associated with SRP for 2018.

Table 10: Summary of 2018 SRP Funding Request

SRP Initiative	Cost
Heat Map	$80,000
Marketing & Engagement Plan	$124,800
Tiverton Pilot	$85,000
Little Compton Battery Storage	$109,500
Total	**$399,300**

[12] From page 27 of this Report

Table S-1
National Grid
System Reliability Procurement
Funding Sources
$(000)

		2018
(1)	**2018 SRP Budget**	**$399.3**
(2)	**Projected Year-End Fund Balance and Interest:**	**$322.3**
(3)	**Customer Funding Required:**	**$77.0**
(4)	**Forecasted kWh Sales:**	**7,292,198,600**
(5)	**Additional SRP Funding Needed per kWh:**	**$0.00000**
(6)	**Proposed Energy Efficiency Program charge in EEPP**	**$0.01000**
(7)	**Proposed Total Energy Efficiency Program charge in EEPP**	**$0.01000**
(8)	**Proposed Total Energy Efficiency Program charge w/ Uncollectible Recovery**	

Notes

(1)Projected Budget includes only additional funds for SRP. It does not include costs associated with focused energy efficiency.
(2) Proposed Total Energy Efficiency Program charge is the sum of the "Additional SRP Funding Needed per kWh" and "Proposed Energy Efficiency Program charge in EEPP" lines.
(3) All dollar amounts shown are in $current year.

Miscellaneous Provisions

A. Other than as expressly stated herein, this Settlement establishes no principles and shall not be deemed to foreclose any party from making any contention in any future proceeding or investigation before the PUC.

B. This Settlement is the product of settlement negotiations. The content of those negotiations is privileged and all offers of settlement shall be without prejudice to the position of any party.

C. Other than as expressly stated herein, the approval of this Settlement by the PUC shall not in any way constitute a determination as to the merits of any issue in any other PUC proceeding.

The Parties respectfully request the PUC approve this Stipulation and Settlement as a final resolution of all issues in this proceeding.

Respectfully submitted,

THE NARRAGANSETT ELECTRIC COMPANY D/B/A NATIONAL GRID

10/30/2017

By its Attorney, Date
Raquel J. Webster

ACADIA CENTER

10/25/17

By its Policy Advocate, Date
Erika Niedowski

RHODE ISLAND DIVISION OF PUBLIC UTILITIES AND CARRIERS

Jon E. Hagopian 10/25/17

By its Deputy Chief Legal Counsel, Date
Jon Hagopian, Esq.

THE RHODE ISLAND ENERGY EFFICIENCY AND RESOURCE MANAGEMENT COUNCIL

By its Attorney, Date: 10/24/17
Marisa Desautel

OFFICE OF ENERGY RESOURCES

10/25/17

By its Commissioner, Date
Carol J. Grant

PEOPLE'S POWER & LIGHT

10/26/17

By its Executive Director, Date
Larry Chretien

APPENDICES

Appendices

Appendix 1
Rhode Island and Company Electric Service Projected Load Growth Rates

Appendix 2
Tiverton NWA Pilot Benefit Cost Analysis Tables

Appendix 3
Tiverton Pilot Evaluation Deliverables from Opinion Dynamics Corporation

Appendix 4
Projects Screened for NWA

APPENDIX 1

Appendix 1 – Rhode Island Company Electric Service Projected Load Growth Rates

RHODE ISLAND PROJECTED GROWTH RATES (Percents)

			Annual Growth Rates (percents)											5-yr avg	10-yr avg
State	County	Town	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	'17 to '21	'17 to '26
RI			0.6	-0.6	-0.2	0.0	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0.3
RI	Bristol		0.1	-1.1	-0.7	-0.4	-0.1	0.1	0.1	0.2	0.2	0.2	0.3	-0.4	-0.1
RI	Kent		0.2	-1.0	-0.6	-0.3	0.0	0.1	0.2	0.2	0.2	0.3	0.3	-0.3	0.0
RI	Newport		0.3	-0.9	-0.5	-0.3	0.0	0.2	0.3	0.3	0.3	0.3	0.4	-0.3	0.0
RI	Providence		0.7	-0.5	-0.1	0.1	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.1	0.3
RI	Washington		1.7	0.4	0.6	0.8	1.0	1.1	1.0	1.0	0.9	0.9	0.9	0.9	0.9
RI	Newport	Tiverton	1.0	-0.2	0.1	0.3	0.5	0.6	0.7	0.6	0.6	0.6	0.6	0.3	0.5
RI	Newport	Little Compton	1.3	0.0	0.3	0.4	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.5	0.6

vintage: fall 2016

NE_PEAK_2017_Report_28Oct2016_v0_F

APPENDIX 2

Appendix 2 – Tiverton NWA Pilot Benefit Cost Analysis Tables

Table S-2
System Reliability Procurement - Tiverton/Little Compton
Summary of Cost Effectiveness ($000)

	2012	2013	2014	2015	2016	2017	Overall
Benefits	**$179.0**	**$1,325.4**	**$1,033.3**	**$1,281.1**	**$687.7**	**$668.5**	**$5,175.0**
Focused Energy Efficiency Benefits[1]	$90.2	$1,015.1	$716.7	$1,024.8	$435.0	$497.6	$3,779.4
SRP Energy Efficiency Benefits[2]	$88.8	$310.4	$136.8	$78.0	$88.1	$11.3	$713.3
Demand Reduction Benefits[3]	$0.0	$0.0	$5.6	$6.8	$5.3	$11.4	$29.0
Deferral Benefits[4]	$0.0	$0.0	$174.2	$171.5	$159.4	$148.2	$653.3
Costs	**$133.4**	**$672.4**	**$569.3**	**$1,029.4**	**$611.1**	**$1,122.6**	**$4,138.3**
Focused Energy Efficiency Costs[5]	$46.6	$331.1	$195.8	$529.3	$280.1	$804.0	$2,186.9
System Reliability Procurement Costs[6,7]	$86.8	$341.3	$373.5	$500.2	$331.0	$318.6	$1,951.5
Benefit/Cost Ratio	**1.34**	**1.97**	**1.81**	**1.24**	**1.13**	**0.60**	**1.25**

Notes:

(1) Focused EE benefits in each year include the NPV (over the life of those measures) of all TRC benefits associated with EE measures installed in that year that are being focused to the Tiverton/Little Compton area.

(2) SRP EE benefits include all TRC benefits associated with EE measures installed in each year that would not have been installed as part of the statewide EE programs.

(3) DR benefits represent the energy and capacity benefits associated with the demand reduction events projected to occur in each year.

(4) Deferral benefits are the net present value benefits associated with deferring the wires project (substation upgrade) for a given year in $2014.

(5) EE costs include PP&A, Marketing, STAT, Incentives, Evaluation and Participant Costs associated with statewide levels of EE that have been focused to the Tiverton/Little Compton area. For the purposes of this analysis, they are derived from the planned ¢/Lifetime kWh in Attachment 5, Table E-5 of each year's EEPP in the SF EnergyWise and Small Business Direct Install programs. These are the programs through which measures in this SRP pilot will be offered.

(6) SRP costs represent the SRPP budget which is separate from the statewide EEPP budget, as well as SRP participant costs. The SRP budget includes PP&A, Marketing, Incentives, STAT and Evaluation.

(7) All costs and benefits are in $current year except for deferral benefits.

(8) 2012-2016 numbers have been updated to reflect year end data. 2017 numbers reflect year end projections.

Table S-3
National Grid
System Reliability Procurement - Tiverton/Little Compton
Annual Budgets and Actual Costs
$(000)

	Program Planning & Administration	Marketing	Rebates and Other Customer Incentives	Sales, Technical Assistance & Training	Evaluation & Market Research	Total
2012	$2.6	$24.7	$32.5	$2.0	$25.1	$86.8
2013	$67.9	$77.1	$102.0	$1.4	$90.7	$339.0
2014	$74.9	$78.1	$87.0	$6.0	$125.4	$371.5
2015	$90.6	$85.1	$67.6	$97.6	$157.2	$498.1
2016	$31.5	$89.6	$11.9	$60.0	$136.3	$329.3
2017	$50.0	$80.0	$13.1	$54.4	$120.0	$317.5
Total	**$317.5**	**$434.6**	**$314.0**	**$221.4**	**$654.6**	**$1,942.1**

Notes:
(1) The annual totals in this table represent only the forecasted funds necessary to run the Tiverton/Little Compton pilot. They do not include costs associated with focused energy efficiency or with SRP participant costs.
(2) All amounts shown are in $current year.
(3) 2012-2016 numbers have been updated to reflect year end data. 2017 numbers have been updated to reflect year end projectsions

Table S-4
System Reliability Procurement - Tiverton/Little Compton
Summary of kW, and kWh New Installs Per Year

			Capacity (kW)			Energy (MWh)	
			Summer	Winter	Lifetime	Maximum Annual	Lifetime
2012	EE	Residential	17	20	102	121	642
		Commercial	4	2	44	7	85
		SRP	8	8	121	4	55
	Non-EE	Demand Response	13	0	13		
	Total		**42**	**30**	**280**	**132**	**782**
2013	EE	Residential	77	86	527	505	2,953
		Commercial	55	32	653	205	2,440
		SRP	78	33	1,362	80	883
	Non-EE	Demand Response	56	0	56		
	Total		**266**	**152**	**2,598**	**790**	**6,276**
2014	EE	Residential	50	59	419	334	2,737
		Commercial	12	9	128	69	758
		SRP	40	9	746	51	535
	Non-EE	Demand Response	17	0	17		
	Total		**120**	**78**	**1,310**	**455**	**4,030**
2015	EE	Residential	93	109	850	619	5,454
		Commercial	17	15	207	41	489
		SRP	23	7	396	26	271
	Non-EE	Demand Response	11	0	11		
	Total		**144**	**131**	**1,465**	**685**	**6,214**
2016	EE	Residential	50	58	464	318	2,807
		Commercial	5	4	61	29	359
		SRP	26	4	255	21	183
	Non-EE	Demand Response	6	0	6		
	Total		**87**	**67**	**786**	**368**	**3,349**
2017	EE	Residential	41	49	625	336	4,795
		Commercial	8	8	104	32	394
		SRP	7	8	164	4	34
	Non-EE	Demand Response	1	0	1		
		RFP	0	0	0	0	0
	Total		**58**	**65**	**894**	**372**	**5,224**
Grand Total			**717**	**522**	**7,334**	**2,802**	**25,874**

Notes:
(1) The "EE" savings include both Focused Energy Efficiency savings and SRP Energy Efficiency Savings.
(2) Measures unique to SRP and not offered in the same way through the statewide EE programs are listed as a separate line item (SRP) under the EE heading. Measures part of the focused EE are listed in the EnergyWise and Small Business program lines.
(3) Savings in this table are not cumulative. Each year shows savings from measures that will have been installed within that year.
(4) 2012-2016 numbers have been updated to reflect year end data and 2017 numbers have been updated to reflect year end projections
(5) Demand Response estimated kWh savings are shown on table S-6.

Table S-5
System Reliability Procurement - Tiverton/Little Compton
Summary of Incremental Benefits By Year

				Capacity ($)						Energy ($)					Non-Electric ($)	
			Total Benefits	Summer Generation	Winter Generation	Transmission	MDC/ Deferral(3)	DRIPE	Winter Peak	Winter Off-Peak	Summer Peak	Summer Off-Peak	DRIPE	Resource	Non - Resource
2012	EE	Residential	68,954	2,735	0	2,314	9,724	473	17,057	8,696	10,374	4,444	5,586	0	7,552
		Commercial	21,251	1,709	0	984	4,135	474	2,831	688	1,698	338	627	0	7,765
		SRP	88,810	6,590	0	2,638	11,082	1,224	35	117	2,257	1,193	292	63,381	0
	Non-EE	Demand Reduction	0	0	0	0	0	0	0	0	0	0	0	0	0
		Deferral	0	0	0	0	0	0	0	0	0	0	0	0	0
		Total	**179,015**	**11,035**	**0**	**5,936**	**24,941**	**2,171**	**19,924**	**9,500**	**14,329**	**5,975**	**6,505**	**63,381**	**15,317**
2013	EE	Residential	715,520	19,112	0	12,066	50,700	3,990	79,472	43,584	49,862	22,710	25,456	362,998	45,569
		Commercial	299,547	31,822	0	14,689	61,719	8,065	84,675	20,430	50,364	10,075	17,708	0	0
		SRP	310,370	67,287	0	30,582	128,499	14,693	261	967	45,399	16,336	6,346	0	0
	Non-EE	Demand Reduction	0	0	0	0	0	0	0	0	0	0	0	0	0
		Deferral	0	0	0	0	0	0	0	0	0	0	0	0	0
		Total	**1,325,438**	**118,221**	**0**	**57,338**	**240,918**	**26,749**	**164,407**	**64,981**	**145,625**	**49,122**	**49,510**	**362,998**	**45,569**
2014	EE	Residential	641,519	29,866	0	17,044	0	3,214	68,295	46,885	41,650	17,727	35,790	350,408	30,639
		Commercial	75,220	11,229	0	5,201	0	963	26,032	6,580	12,466	2,916	9,835	0	0
		SRP	136,801	63,099	0	30,271	0	5,344	118	479	22,591	8,861	6,038	0	0
	Non-EE	Demand Reduction	5,563	1,989	0	3,521	0	0	0	0	54	0	0	0	0
		Deferral	174,188	0	0	0	174,188	0	0	0	0	0	0	0	0
		Total	**1,033,291**	**106,183**	**0**	**56,037**	**174,188**	**9,521**	**94,445**	**53,944**	**76,760**	**29,504**	**51,662**	**350,408**	**30,639**
2015	EE	Residential	953,990	74,891	0	34,529	0	7,247	153,698	83,936	75,394	38,919	72,456	366,076	46,844
		Commercial	70,792	21,238	0	8,337	0	1,422	18,325	4,693	9,039	2,126	5,611	0	0
		SRP	77,987	38,200	0	15,987	0	2,917	73	292	12,461	5,051	3,006	0	0
	Non-EE	Demand Reduction	6,802	2,411	0	4,074	0	0	0	0	317	0	0	0	0
		Deferral	171,482	0	0	0	171,482	0	0	0	0	0	0	0	0
		Total	**1,281,053**	**136,739**	**0**	**62,929**	**171,482**	**11,587**	**172,095**	**88,920**	**97,211**	**46,096**	**81,074**	**366,076**	**46,844**
2016	EE	Residential	399,334	65,614	0	5,410	0	0	82,277	50,023	37,105	20,112	1,543	115,983	21,267
		Commercial	35,633	9,151	0	702	0	0	14,076	3,648	6,434	1,454	168	0	0
		SRP	88,093	35,504	0	2,979	0	0	603	1,102	6,683	3,067	179	37,976	0
	Non-EE	Demand Reduction	5,260	3,604	0	1,224	0	0	0	0	431	0	0	0	0
		Deferral	159,412	0	0	0	159,412	0	0	0	0	0	0	0	0
		Total	**687,732**	**113,873**	**0**	**10,315**	**159,412**	**0**	**96,957**	**54,772**	**50,654**	**24,633**	**1,889**	**153,959**	**21,267**
2017	EE	Residential	452,136	88,756	0	6,076	0	0	161,506	83,545	75,765	34,962	921	0	603
		Commercial	45,507	15,495	0	1,088	0	0	15,700	4,070	7,369	1,686	101	0	0
		SRP	11,264	8,429	0	630	0	0	26	111	1,389	658	21	0	0
	Non-EE	Demand Reduction	11,423	9,993	0	1,122	0	0	0	0	308	0	0	0	0
		Deferral	148,191	0	0	0	148,191	0	0	0	0	0	0	0	0
		Total	**668,521**	**122,674**	**0**	**8,915**	**148,191**	**0**	**177,232**	**87,726**	**84,831**	**37,306**	**1,042**	**0**	**603**
Grand Total			**5,175,050**	**608,725**	**0**	**201,470**	**919,132**	**50,028**	**725,061**	**359,843**	**469,411**	**192,636**	**191,682**	**1,296,823**	**160,239**

Notes:
(1) The "EE" benefits include both Focused Energy Efficiency benefits and SRP Energy Efficiency benefits.
(2) Measures unique to SRP are listed as a separate line item under the EE heading. Measures part of the focused EE are listed in the EnergyWise and Small Business program lines.
(3) The MDC/Deferral column represents: 2012-2013: the system-average distribution benefit and 2014-2017: the calculated deferral benefit as defined in the notes section of Table S-2
(4) All benefits are in $current year except deferral benefits which are in $2014.
(5) 2012-2016 amounts have been updated to reflect year end data. 2017 amounts have been updated to reflect year end projections.
(6) Benefits due to EE reflect new installations within the year. Benefits due to Non-EE reflect cumulative installations

Table S-6
System Reliability Procurement - Tiverton/Little Compton
Demand Reduction

	Tstats	Smart Plug
Per- Event Capacity Savings per Residential Participant (kW)	**0.49**	**0.04**
Per- Event Capacity Savings per C&I Participant (kW)	**0.98**	**n/a**

	2012	2013	2014	2015	2016	2017
Number of Event Hours						
Thermostats			12	60	72	48
Plug Load Devices			6	30	36	24
Units						
Thermostats - Residential	35	167	205	232	247	251
Thermostats - C&I	0	4	4	4	4	4
Plug Load Devices	0	145	249	298	308	308
Forecasted Annual Capacity Savings (kW)	**13**	**69**	**86**	**97**	**103**	**104**
Thermostats - Residential	13	61	75	85	91	92
Thermostats - C&I	0	3	3	3	3	3
Smart Plugs	0	4	7	9	9	9
Forecasted Annual Energy Savings (kWh)	**0**	**0**	**984**	**5,560**	**7,080**	**4,791**
Thermostats - Residential	0	0	904	5,116	6,536	4,428
Thermostats - C&I	0	0	35	176	212	141
Smart Plugs	0	0	45	268	333	222
Cumulative Annual Demand Reduction Benefits ($)			**5,563**	**6,802**	**5,260**	**11,423**
Annual Energy Benefits ($)			54	317	431	308
Annual Capacity Benefits ($)			5,510	6,485	4,828	11,115

Notes:

(1) Forecasted event hours are based on an assumed three days of four-hour events, four times per year. In each event, it is assumed that the demand reduction will be staggered in two groups and cycled on and off.
(2) Savings above represent 75% of max to account for non-participation.
(2) All dollar amounts are in $current year.
(3) 2012-2016 amounts have been updated to reflect year end data and 2017 amounts have been updated to reflect year end projections.

Table S-7
System Reliability Procurement - Tiverton/Little Compton
Potential for Wires Project Deferral at Year Begin

	2012	2013	2014	2015	2016	2017	2018
Cumulative Annual kW from Energy Efficiency			**239**	**342**	**475**	**556**	**612**
Focused Energy Efficiency			153	215	325	381	430
SRP Energy Efficiency			86	127	149	175	183
Cumulative Annual kW from Demand Reduction			**82**	**86**	**97**	**103**	**104**
Thermostats - Residential			74	75	85	91	92
Thermostats - C&I			3	3	3	3	3
Smart Plugs			4	7	9	9	9
Cumulative Annual kW from RFP							-
Total Cumulative kW Reduction From DemandLink			**321**	**427**	**572**	**659**	**717**
Total Cumulative kW Reduction Needed to Defer Wires Project			**150**	**390**	**630**	**860**	**1,000**
% Deferral Targets Achieved by DemandLink			214%	110%	91%	77%	72%

Notes:
(1) All kW amounts are Summer kW and are cumulative.
(2) This table shows the number of kW have been either installed through EE or have become available to reduce through demand reduction by the end of the previous year to therefore contribute to the deferral of the wires investment in the current year.
(3) kW in Reserve acts as insurance against customers overriding the demand reduction themselves, so that the required reduction is still met.
(4) 2012 -2016 amounts have been updated to reflect year end data. 2017 amounts have been updated to reflect year end projections.

APPENDIX 3

Appendix 3 –Tiverton Pilot Evaluation Deliverables from Opinion Dynamics Corporation

Opinion Dynamics

Boston | Headquarters

617 492 1400 tel
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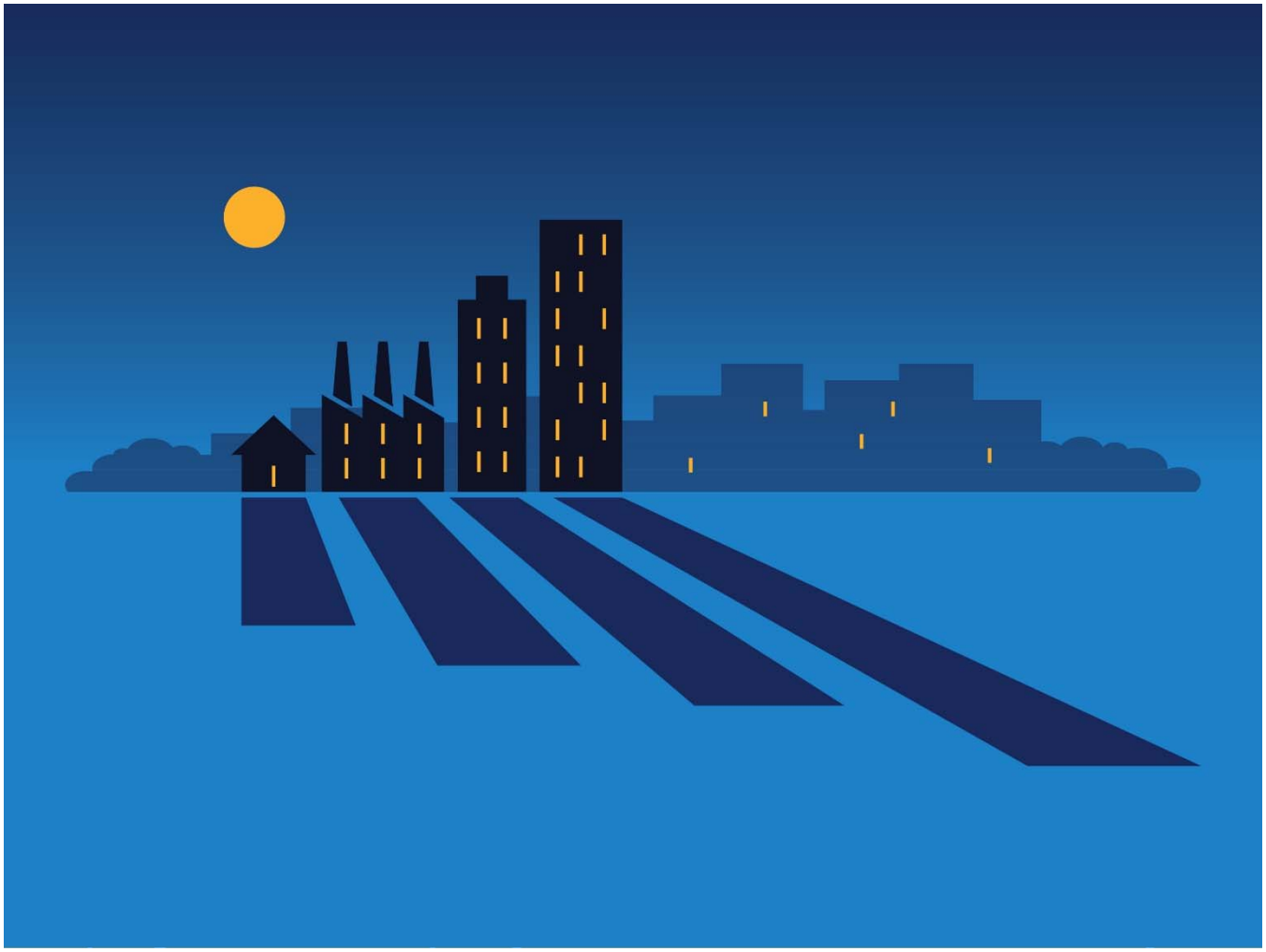
1000 Winter St
Waltham, MA 02451



National Grid Rhode Island System Reliability Procurement Pilot: 2016 Annual Evaluation Report

FINAL

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Vice President

June 6, 2017

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Executive Summary

This report presents evaluation findings for the fifth year of the Rhode Island System Reliability Procurement (SRP) pilot, conducted by Opinion Dynamics Corporation under contract to National Grid. The SRP pilot was designed to determine whether demand-side management could be an effective method of reducing peak demand on the Tiverton substation (substation feeders 33-34), which serves over 5,000 customers in the pilot communities. Starting in March 2012, National Grid increased marketing and outreach to encourage participation in select statewide energy efficiency programs (the residential EnergyWise Program and the Small Business Direct Install Program) and enrollment in SRP-specific DemandLink offerings (WiFi programmable controllable thermostats and plug devices used to control window AC units). In 2013, the pilot introduced new SRP-specific rebates for the purchase of qualifying window AC units and the recycling of old window AC units. In 2015, the pilot began offering enhanced rebates for electric heat pump water heaters, available for customers who also participate in DemandLink.

This report presents the results of the various research activities and analyses conducted for the 2016 SRP pilot year. Research activities included two primary data collection efforts: an online survey of customers in the pilot area and a telephone survey of DemandLink participants. We conducted analyses of gross impacts for measures installed through the EnergyWise Program and for the 2016 demand response events. We used the "take rate" established in the 2015 Annual Evaluation Report to establish net load impacts for the EnergyWise Program. Finally, we conducted an analysis of marketing effectiveness for key marketing efforts employed in 2016 as well as an analysis of participant experience during the August 29th demand response event.

Impact Results

This evaluation included an analysis of load reduction for the two major pilot offerings: the Energy Wise Program and the DemandLink demand response events. While demand savings were realized by other components of the pilot, these were not included in the evaluation of the 2016 program year.

We estimate 2016 gross demand savings from the EnergyWise Program to be 254 kW. This estimate includes all installations for the pilot-to-date, i.e., it assumes that all rebated measures are still in place. It should also be noted that this is a gross estimate. Since the EnergyWise Program is also offered as a statewide program, some of the installations would have happened even without the pilot's efforts. Our estimate of EnergyWise net demand savings attributable to the pilot is 129 kW. Demand savings from the EnergyWise Program are realized on event and non-event days.

We further estimate 2016 DemandLink event savings of 46 kW for events for central AC participants and 0.018 kW for events for window AC participants. Event savings are based on thermostats and plug devices that were operational during the 2016 cooling season and are realized on event days only.

While estimated peak demand savings for the EnergyWise Program exceeded targets, savings from the demand response events were significantly below targets, largely driven by low counts of participating units due to missing log files and missing data in log files that we did receive.

Table ES-1 summarizes these findings.

Table ES-1. Summary of kW SRP Impacts Compared to Targets – Cumulative through 2016

Program	Estimated Peak Demand Savings (kW)	Target (kW)	% Target
EnergyWise	254	209	121%
DemandLink Demand Response Events (Central AC)	46	147	31%
DemandLink Demand Response Events (Window AC)	0.018	11	0.2%

Other Findings

Below, we present other key findings based on the research activities and analyses conducted for the 2016 program year.

EnergyWise Evaluation

Participation

- In 2016, customers in the pilot area completed 155 assessments which represents a 42% decrease from 2015.

Impacts

- In 2016, the estimated cumulative gross peak load reduction from EnergyWise measures installed during the pilot period is 254 kW; the equivalent cumulative net peak load reduction is 129 kW. LEDs continued to be a predominant measure, although installations declined by over 50% relative to 2015. Participants installed approximately 5,000 LED bulbs which accounted for 83% of new peak load reduction from EnergyWise measures in 2016. Meanwhile, installations of CFLs continued to decline from previous years.

Program Awareness and Interest

- Awareness of the EnergyWise program among those who have not yet participated in the program is high: 70% of non-participants have heard of the program. Pilot-specific marketing over the past five years is likely responsible for this high level of awareness: Over half of non-participants (53%) remembered receiving information about the EnergyWise Program during 2016, most often in the mail.

- Non-participants in the EnergyWise Program report a high likelihood of participation in the program during 2017 (46%). While barriers to participation among non-participants vary, difficulty finding the time to be home for the assessment is one of the most often cited reasons.

DemandLink WiFi Thermostat and Plug Device Evaluation

Participation

- In 2016, 12 new participants signed up to participate in the DemandLink Thermostat Program, bringing the total for the pilot-to-date to 269 participants. Substation participants with central AC installed 13 thermostats and participants with window AC installed 8 plug devices in 2016.

- New participant sign-ups continue to decline. In January 2016, the pilot stopped installing new central AC thermostats in customer's homes and began enrolling new pilot participants through the

statewide Connected Solutions. The pilot also discontinued installation of plug devices in 2016, due to connectivity issues and the resulting low demand response event participation observed in 2014 and 2015.

Impacts

- The pilot called a total of 18 demand response events between July and September 2016. Similar to 2015, the control strategy in 2016 consisted of a 2°F temperature increase for customers with central AC between 3 p.m. and 7 p.m. and a shut-down of customers' window AC units between 4 p.m. and 6 p.m.

- Similar to prior years, the program experienced difficulty with the functionality and connectivity of window AC thermostats and plug devices. A new issue in 2016, however, was the non-availability of a large percentage of window AC log files: For August and September events, we received log files for 77% of installed thermostats; for July events, we received log files for only 49% of installed thermostats. Even the log files we received showed data issues, with between 9% and 10% (depending on the event) of August and September files and none of the July files having any usable data. These data issues are at least partially related to the usage issues (participants no longer use the plug device or do not use it with a window AC unit) and connectivity issues (participants do not reconnect their plug device to their WiFi-enabled thermostat) observed in prior evaluations. As a result, we were able to credit the pilot with event savings for less than one thermostat per event, reducing demand savings to 0.018 kW.

- 2016 also showed log file issues for central AC thermostats. Log files were unavailable for 31% of thermostats during July and for 17% of thermostats during August and September. In addition, 13% of July logs and 14% of August and September logs contained no useable data. As a result, the number of participating units in 2016 averages 115 per event, compared to 155 in 2016. Coupled with lower run-time reduction in 2016 (an average of 10.9% compared to 13.3% in 2015), estimated demand response impacts associated with central AC dropped from 76 kW in 2015 to 46 kW in 2016.

- As is often the case with demand response programs, the first hour of the 2016 demand response events achieved the highest savings, with an average of 0.91 kW across all events. Each subsequent event hour achieved smaller savings. Notably, hourly savings for the fourth event hour were zero across all 18 events, with several events achieving negative savings.

Program Awareness and Interest

- Awareness of the DemandLink Thermostat Program among those who have not yet participated is moderate: 42% of non-participants have heard of the program. Less than a quarter of non-participants (22%) reported being likely to participate in the program in 2017. The most common barriers to participation among non-participants are the perception that they do not use the air conditioning enough to benefit from participation and being uncomfortable with someone else controlling their thermostat.

Event Follow-up

- Awareness of the August 29th event among event-eligible participants was moderate: 57% of those with central AC and 50% of those with window AC were aware that the event had been called. Among event-eligible participants with central AC, close to half (47%) were home during the event and 10% reported having opted-out of the event, citing discomfort or anticipation of discomfort as the

influencing factor. Among event-eligible respondents with window AC, only 17% (2 out of 12) were home during the event, and none opted out.

- Over half of event-eligible participants (65%) recall National Grid calling at least one event over the summer; the average number of events they recalled was 10. These respondents indicated they were home for just over half (59%) of the events they recalled. Notably, only 8% of participants who recalled at least one 2016 event (n=26) thought that National Grid had called too many events. Almost all participants (95%) plan to participate in future events.

- Respondents to the Demand Response Event Follow-up Survey reported continued installation and use of the programmable thermostats during the 2016 cooling season. All 30 survey respondents with central AC and 55% of survey respondents with window AC reported using at least one of their thermostats to control their AC unit. These results, while self-reported by participants and not independently verifiable, appear to contradict the low number of participating units based on the log files and underscores concerns about the large number of missing log files.

- Participants with central AC are highly aware of the various elements of the DemandLink Program; awareness of participants with window AC is systematically lower. For both groups, awareness of the bill credit is significantly lower than awareness of other program elements, a notable finding as survey responses show anecdotal evidence that low awareness of the bill credit might be correlated with a higher likelihood to opt out of an event.

- For window AC participants, awareness of demand response events seems to be correlated with using the plug devices with window AC units: All five respondents with window AC who were unaware of the events did not have a plug device installed; conversely, 87% respondents with window AC who were aware of demand optimization events reported using at least one plug device with their window AC.

Window AC Rebate and Recycling Evaluation

- In 2016, customers received rebates for purchasing 27 new ENERGY STAR® rated units and for recycling 37 old units. Compared to 2015, equipment counts for both types of rebate increased in 2016.

- Awareness of the Window AC and Recycling Programs is moderate. Among non-participants who plan to either use window AC in the summer and/or recycle an unwanted unit, 43% have heard of the purchase rebate while 29% have heard of the recycling rebate.

- Based on survey responses, the potential customer base eligible to receive a rebate for purchasing a new window AC unit is quite large: Almost 4 out of 10 customers (39%) use or plan to use window AC to cool their home in the summer, and 35% of those window AC users (or 14% of all customers) are likely to purchase a new window AC unit in 2017. A large majority of these likely buyers (93%) reported that they are likely to purchase an ENERGY STAR® rated model and apply for a rebate from National Grid.

- Only 19% of customers have window AC units that they no longer use or that they might replace in 2017. Of these, a large majority (87%) are likely to recycle an old unit, and nearly all of these likely recyclers (91%) reported that they are likely to apply for a rebate from National Grid for doing so.

Heat Pump Water Heater Program

- In 2016, 17 DemandLink customers participated in the HPWH Program, up from 10 in 2015.
- Given that the HPWH rebate is a relatively new offering for the pilot, non-participating homeowners report a relatively high awareness of the rebate (36%) and likelihood to purchase a new HPWH through the program (38%). Not surprisingly, those who had previously considered replacing their current water heater (22% of non-participating homeowners) have higher levels of awareness and a significantly higher likelihood to participate than those who had not considering doing so.
- Barriers to participation in the HPWH Program include having recently installed a new water heater (39%), simply not being interested/not needing a new water heater (23%), and using a different type of water heater with no interest is switching (17%).

Marketing Effectiveness

- Participant recall of messaging about components in which they had already participated (in 2016 or prior years) was very high, with 88% of EnergyWise and 93% of DemandLink participants remembering receiving program information in 2016. These participants most often recalled receiving information in the mail (52% and 47%, respectively). Program participants less frequently remembered receiving emails (28% and 30%, respectively) or phone calls (13% and 5%, respectively) from the pilot.
- Non-participant recall of component-specific messaging was lower compared to participants, but still high: 53% of customers who have not yet participated in the EnergyWise Program remembered receiving information about it 2016, most often in the mail. Recall rates for other program components were significantly lower (37% for window AC rebates, 35% for DemandLink, and 26% for HPWH rebates), yet still relatively high. Across all components, non-participants are most likely to remember information they received in the mail.
- Survey questions about three specific pieces of marketing used in 2016 (a newsletter, a post card, and an email) show that the direct mail pieces were more memorable than the emails, and that participants and non-participants tended to recall the materials at similar rates. Recall rates by non-participants are relatively high, at 42% for the newsletter, 41% for the postcard, and 20% for the email.
- Both participants and non-participants generally found the messaging in the three pieces of marketing to be clear. DemandLink participants found the messaging around checking the connectivity of their thermostat to be clearer in the post card, compared to the newsletter, which also including a lot of other topics.
- Of non-participants eligible to participate in the various components, about one-third are interested in seeking more information about window AC rebates (38%), the EnergyWise program (35%), and the HPWH rebate (31%). Significantly fewer DemandLink non-participants are likely to seek more information about the DemandLink Program (23%).

Recommendations

Based on our research and analyses, we provide the following opportunities for program improvement:

- **Explore issues of missing thermostat log files and missing log file data with Ecobee.** During the 2016 cooling season, Opinion Dynamics provided National Grid with regular status updates on the

availability and quality of log files received from Ecobee. Despite these updates, Ecobee was unable to provide a large percentage of log files for window AC thermostats (51% missing for July; 23% missing for August/September) and even for central AC thermostats (31% missing for July; 17% missing for August/September), which had not previously experienced significant connectivity issues. In addition, many log files did not contain any of the data needed for the analysis. Given the significantly lower demand response event impacts in 2016, we recommend that National Grid explore these issues with Ecobee prior to the 2017 cooling season, to avoid another year of low impacts.

- **Discontinue events for window AC, if issues of missing log files and missing log files data cannot be resolved.** Based on the window AC log files provided by Ecobee, it appears that a majority of window AC participants are no longer present in the portal, and therefore cannot receive event signals, when events are called during the cooling season. If the log file issues cannot be resolved, we recommend that National Grid no longer call events for window AC, which might save the pilot administrative costs associated with these events.

- **Consider using a different central AC demand control strategy in 2017.** Our last evaluation had commented on the 2°F temperature offset control strategy used for the first time in 2015 and encouraged the pilot to test different strategies. Findings from this evaluation confirm that the current control strategy is not optimal. Hourly impact results for central AC thermostats show decreasing savings with each passing hour. While this is expected with a 2°F temperature offset control strategy, average 2016 savings during the last event hour are actually zero, meaning that participating thermostats have resumed their baseline state of operation. Given that average event savings are calculated across the four event hours, including this last hour contributes no additional savings but substantially reduces the average savings across the duration of the event. Depending on the pilot area's exact load reduction needs, we recommend that National Grid consider one of the following strategies: (1) keep the 2°F temperature offset strategy but reduce the length of the events to 2 or 3 hours; (2) keep the event length of 4 hours, but increase the offset strategy to 3 or 4°F; (3) keep the 2°F temperature offset strategy and the 4-hour overall event length, but implement rolling events, i.e., do not send the event signal to all participants at the same time.

- **Continue the pre-season messaging to DemandLink participants.** DemandLink participants had a relatively high level of recall (43%) of the post card reminding them to check the connectivity of their thermostat, and they found the messaging to be clear. In contrast, none of the respondents who were asked about the email with similar messaging (n=10) recalled it. While our research was not designed to assess participant actions following receipt of the messaging during the pre-cooling season, survey findings indicate that email messaging is not sufficient in prompting participants to take the desired actions. Our research further found anecdotal evidence that lack of awareness of the bill credit might be correlated with a higher likelihood of opting out. Pre-cooling season messaging should therefore include a reminder that a bill credit is available to those who participate in all events.

- **Offer and advertise EnergyWise assessments in the evenings and on weekends.** Participation in the EnergyWise Program continues to be a cornerstone of savings for the pilot. While non-participant program awareness and interest in participating is high, one of most frequently cited barriers to participation is difficulty finding the time to be home for the assessment. The program should make sure to offer, and advertise in its messaging, options for conducting the assessment at various times, including in the evenings and on weekends.

1. Introduction

This report presents evaluation findings for the fifth year of the Rhode Island System Reliability Procurement (SRP) pilot, conducted by Opinion Dynamics Corporation under contract to National Grid.

1.1 Program Overview

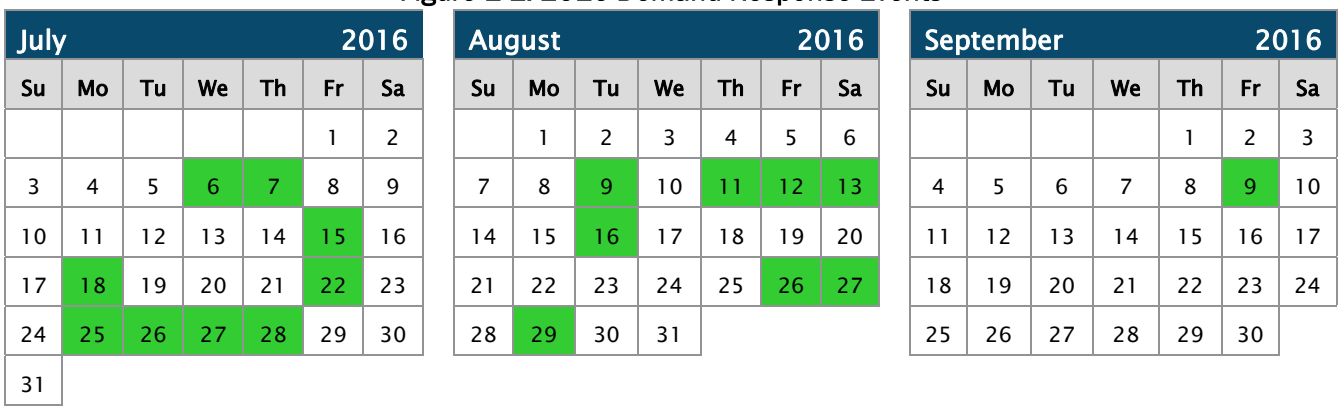
The SRP pilot was designed to determine whether demand-side management could be an effective method of reducing peak demand on the Tiverton substation, which serves over 5,000 customers in the pilot communities of Tiverton and Little Compton.[1] Starting in March 2012, National Grid increased marketing and outreach to encourage participation in select existing statewide energy efficiency programs as well as new programs that are offered exclusively to customers in the Tiverton and Little Compton pilot area.

Pilot-specific Offerings

- **DemandLink Programmable Controllable Thermostat Program**. The DemandLink Thermostat Program provides temperature control devices — WiFi Programmable Controllable Thermostat and plug devices — to customers in Tiverton and Little Compton when they agree to participate in demand optimization events for at least two years. Customers receive an annual bill credit for participating in all demand optimization events. Customers must have a WiFi internet connection and either central air conditioning (central AC) or window air conditioning (window AC) to be eligible. The program supplies all participants with a WiFi-enabled programmable thermostat. Customers with window AC also receive one or more plug devices, which allow the WiFi-enabled thermostat to control their window air conditioners. During 2016, the pilot stopped installing new thermostats in customer's homes. It began enrolling new pilot participants with central AC through the statewide Connected Solutions Demand Response Program and discontinued offering plug devices. National Grid called 18 demand response events in 2016 (see Figure 1-1). Events generally lasted from 3 p.m. to 7 p.m. for central AC units and from 4 p.m. to 6 p.m. for window AC units. For central AC, setpoints were increased by 2 degrees; for window AC, the unit was shut off for the duration of the event.

[1] Not all customers in the towns of Tiverton and Little Compton are served by the two sub-feeders (33 and 34) that are the focus of SRP demand reduction efforts. The analyses in this report are based on customers served by the two sub-feeders only.

Figure 1-1. 2016 Demand Response Events



July 2016						
Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

August 2016						
Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

September 2016						
Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

- **DemandLink Window AC Rebate Program.** Between May 1st and November 1st, 2016 National Grid offered customers in Tiverton and Little Compton a $50 rebate for the purchase of qualifying new window AC units, up to four units per household. Equipment was required to have an energy efficiency ratio (EER) greater than or equal to 10.8 to qualify.

- **DemandLink Window AC Recycling Program.** Between May 1st and November 1st, 2016 National Grid offered customers in Tiverton and Little Compton a $25 rebate for window AC units they recycled, up to four units per household.

Enhanced Statewide Offerings

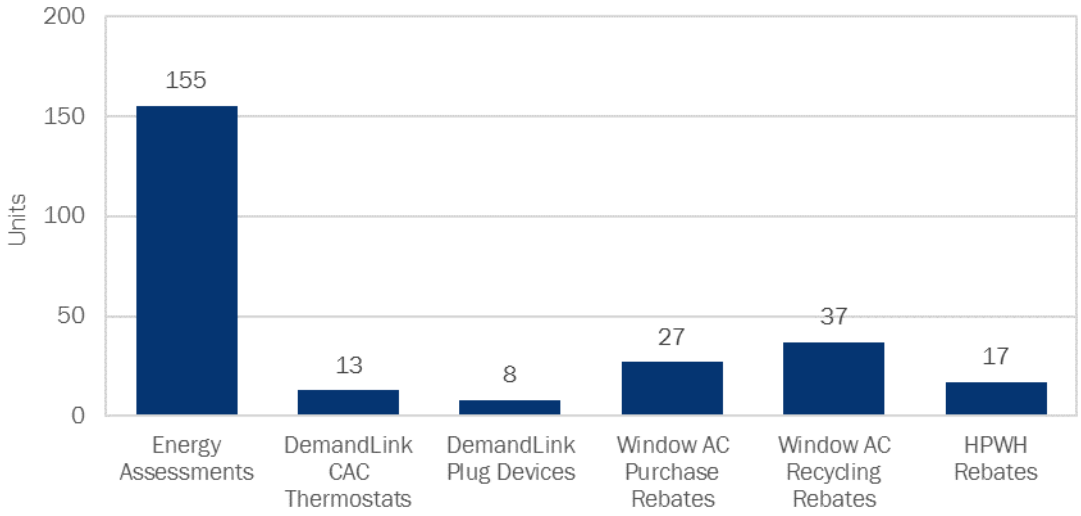
- **EnergyWise Home Energy Assessment Program.** The EnergyWise program provides residential customers with a home energy assessment and a range of direct install measures. It also offers enhanced incentives for additional measures that the customer can install following the assessment. In addition, the program serves as a platform for determining DemandLink eligibility and encouraging DemandLink participation

- **Small Business Direct Install (SBDI) Program.** The SBDI program is the equivalent of the EnergyWise program, but targets small non-residential customers.

- **Electric Heat Pump Water Heater (HPWH) Rebate.** In 2015, National Grid began offering customers an enhance rebate of $1,100 (compared to a $750 rebate offered to all customers statewide) for the purchase of a new electric HPWH. To be eligible for the rebate, customers have to participate in the DemandLink thermostat program.

Figure 1-2 summarizes 2016 achievements of the five residential pilot program components.

Figure 1-2. 2016 Pilot Area Achievements



1.2 2016 Targets and Planning Projections

The most recent cumulative targets for residential equipment installations of WiFi programmable thermostats (among central AC customers) and plug devices among customers served by the Tiverton substation through the end of 2016 were filed in October 2015. For planning purposes, SRP pilot program staff also developed projections for 2016 energy assessments completed through the EnergyWise Program.

In 2016, the pilot fell below planning projections for annual and cumulative equipment installations for energy assessments, DemandLink central AC thermostats, DemandLink plug devices, and HPWH rebates, but exceeded projections for window AC purchase and recycling rebates.

Table 1-1. Equipment Installations Compared to 2016 Planning Projections and Cumulative Targets

Program	Measure	2016 Units		Cumulative Units 2012-2016	
		# Projected	# Achieved	Target	# Achieved
EnergyWise Program	Energy Assessments	251	155	1,143[b]	1,047
DemandLink Thermostat Program	Thermostats for Central AC customers	50	13	303[a]	229
	Plug devices for Window AC customers	60	8	359[a]	300
DL Window AC Rebate and Recycling Program	New ENERGY STAR® Window AC Units	15	27	112[b]	124
	Recycled Window AC Units	30	37	154[b]	161
HPWH Rebate Program	HPWH Units	40	17	50[b]	27

[a] Source: Table S-6 of 2016 System Reliability Procurement Report. The Narragansett Electric Company. October 15, 2015. Docket number 4581.

[b] Calculated as cumulative units achieved in 2012-2015 plus projected units for 2016.

1.3 2016 Evaluation Activities

The evaluation of the 2016 SRP pilot included the following evaluation activities.

Participation Analysis

Using tracking data provided by National Grid, we summarized program participation in the pilot components for 2016 and the pilot to date. This data also served as the basis for sampling for the two surveys conducted in support of the 2016 evaluation.

EnergyWise Load Impact Analysis

We estimated load impacts for the 2016 EnergyWise Program using the same methodology as in prior evaluations: We identified, counted, and assigned ex ante gross load impacts (savings) to all EnergyWise measures installed in the pilot area to-date. We used 2016 load impact factors provided by National Grid for EnergyWise measures. We estimated net load impacts by applying the pilot-to-date "take rate" – established in the 2015 Annual Evaluation Report – to 2016 ex ante savings.

DemandLink Demand Response Event Failure and Opt-Out Analysis

We analyzed thermostat log files for the June through September 2016 peak season, supplied by Ecobee, to understand device connectivity issues and to determine the percentage of signaled devices that were successfully activated during events. We also analyzed the log files to determine how many customers opted out of each event.

DemandLink Demand Response Impact Analysis

We estimated impacts associated with each the 18 demand response events called by National Grid in 2016. For thermostats associated with central AC, we used event-level statistical analysis (regression) to estimate impacts on runtime. For thermostats associated with window AC, we calculated demand impacts by

applying per unit values from the 2014 and 2015 evaluations to participants who successfully received the event signal.

DemandLink Event Follow-Up Survey

We fielded a computer-assisted telephone interviewing (CATI) phone survey with participants who were enrolled in the controllable thermostat program component during the summer of 2016. The survey was conducted in the days following the August 29th demand response event and focused on participant event experience, including awareness of the event, whether the participant was at home, whether they opted out of the event, and the level of comfort (if they were at home).

Marketing Effectiveness Survey

We conducted an online survey with substation customers (program participants and non-participants) to assess a variety of topics: awareness of and interest in the various pilot program offerings, barriers to participation, recall of 2016 marketing activities, and the clarity and effectiveness of common 2016 messaging used in 2016. Appendix D presents details about the survey sampling methodology and survey disposition.

1.4 Organization of Report

The remainder of this report presents the results of the various research activities and analyses conducted in support of the evaluation of the pilot's 2016 program year. It is organized as follows:

- Section 2 presents an overview of 2016 participation in the five key residential pilot program components. This section also includes findings from the Marketing Effectiveness Survey related to program awareness, as well as interest in and barriers to participation among non-participating customers.
- Section 3 presents the EnergyWise gross and net load impact analyses.
- Section 4 presents the analyses of the DemandLink Thermostat Program, including the analysis of demand response event logs and opt-outs, results from the demand response event analyses for central AC and window AC, and findings from the Demand Response Event Follow-up Survey.
- Section 5 presents findings from the Marketing Effectiveness Survey related to customer recall of marketing activities, as well as the clarity and effectiveness of common messaging used in 2016 marketing materials.
- Appendix A provides additional detail on the methodology and results for the EnergyWise load impact analysis.
- Appendix B provides additional detail on the methodology and results for the DemandLink demand response analysis.
- Appendix C provides the detailed results of the Marketing Effectiveness Survey.
- Appendix D presents dispositions and response rates for the online Marketing Effectiveness Survey and the CATI Demand Response Event Follow-up Survey.

Findings in this report cover the period January 1, 2016 through December 31, 2016. In some cases, we provide pilot-to-date values, starting in March 2012.

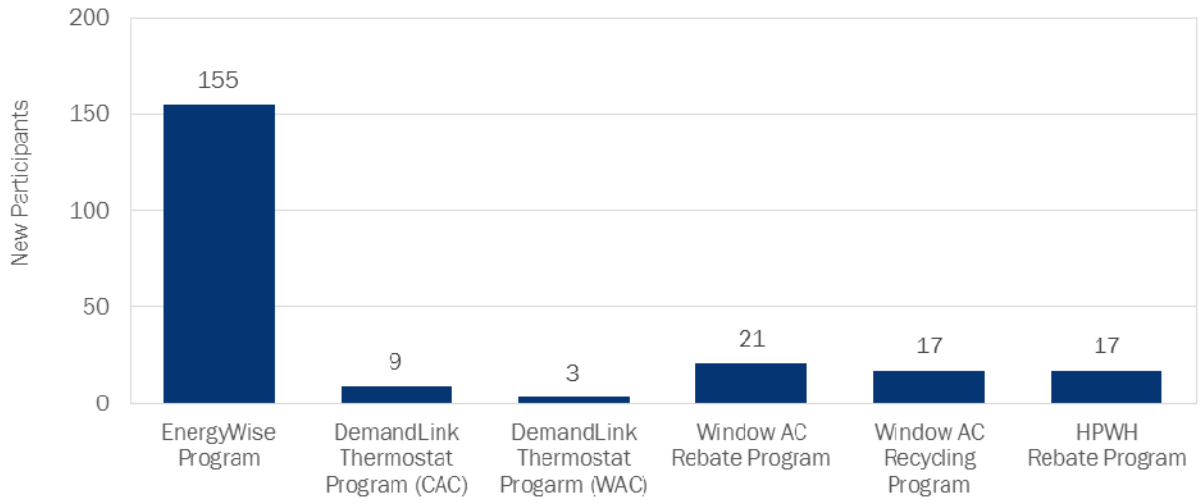
2. Participation Analysis

This section presents participation data for the various components of the pilot – including participation statistics for 2016 and the pilot as a whole – as well as information on program awareness, likelihood to participate, and barriers to participation from the 2016 Marketing Effectiveness Survey.

2.1 Participation Summary

Figure 2-1 provides an overview of the number of new participating households in the residential pilot program components in 2016. The following sections provide additional information for each program component.

Figure 2-1. 2016 Pilot Area Participation



Source: Program Tracking Data

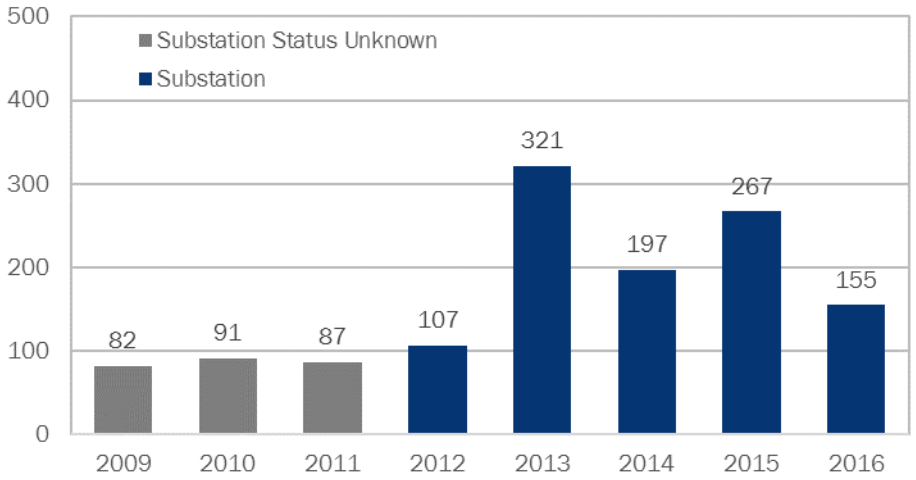
2.2 EnergyWise Program

Participation in the EnergyWise Program is a key measure of the pilot's success and of its potential to recruit participants for the DemandLink Program.

Participation

In 2016, 155 pilot area customers participated in the EnergyWise Program, down from an average of over 260 annual participants between 2013 and 2015. Despite the drop in 2016, participation is still significantly higher compared to pre-pilot levels (2009-2011), when an average of just under 90 pilot area customers participated in the program each year. Figure 2-2 presents annual participation counts in the pilot area.

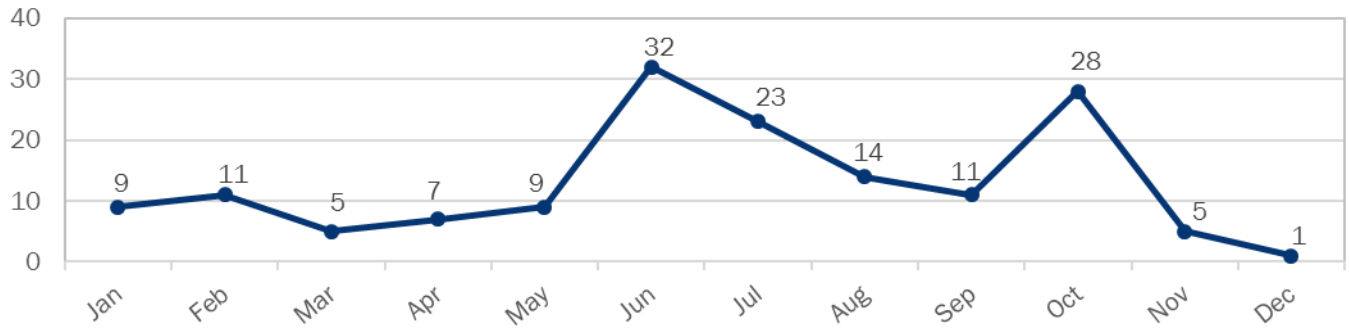
Figure 2-2. EnergyWise Asssessment Participants in SRP Pilot Communities (2009-2016)[a]



Source: Program Tracking Data
[a] Participant counts for the pre-pilot period 2009-2011 include non-substation participants.

Assessment activity was relatively slow between January and May and again at the end of the year. Of the 155 assessments completed in 2016, just over a half (54%) were completed in June, July, and October. June was the busiest month, with 32 assessments completed.

Figure 2-3. EnergyWise Assessments in SRP Pilot Communities by Month (2016)



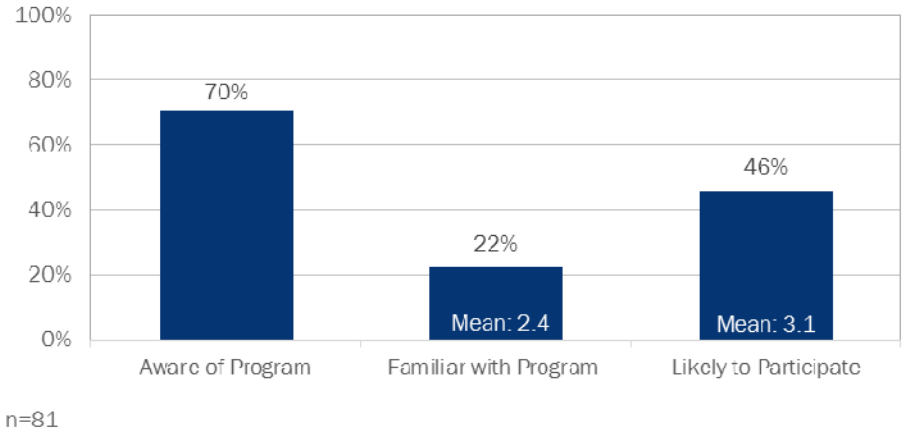
Source: Program Tracking Data

Awareness and Interest

General awareness of the EnergyWise Program is widespread among those who have not yet participated in the program while depth of familiarity is relatively limited: The majority of customers who have not participated in the EnergyWise Program are aware of the program (70%), but fewer than a quarter (22%) are familiar with it.[2] Just under half of those who have not participated (46%) report that they are likely[3] to do so in 2017.

[2] A rating of 4 or 5 on a 5-point scale, where 0 means "not at all familiar" and 5 means "very familiar".

Figure 2-4. Non-Participant Awareness of and Interest in EnergyWise Program



Source: Marketing Effectiveness Survey

Barriers to Participation

EnergyWise non-participants who indicated a low likelihood to participate in the program in 2017[4] were asked to rate their level of agreement with a series of statements regarding barriers to participation. A rating of 4 or 5 on a 5-point scale (where 1 means "very much disagree" and 5 means "very much agree") is defined as agreement while a rating of 1 or 2 is defined as disagreement.

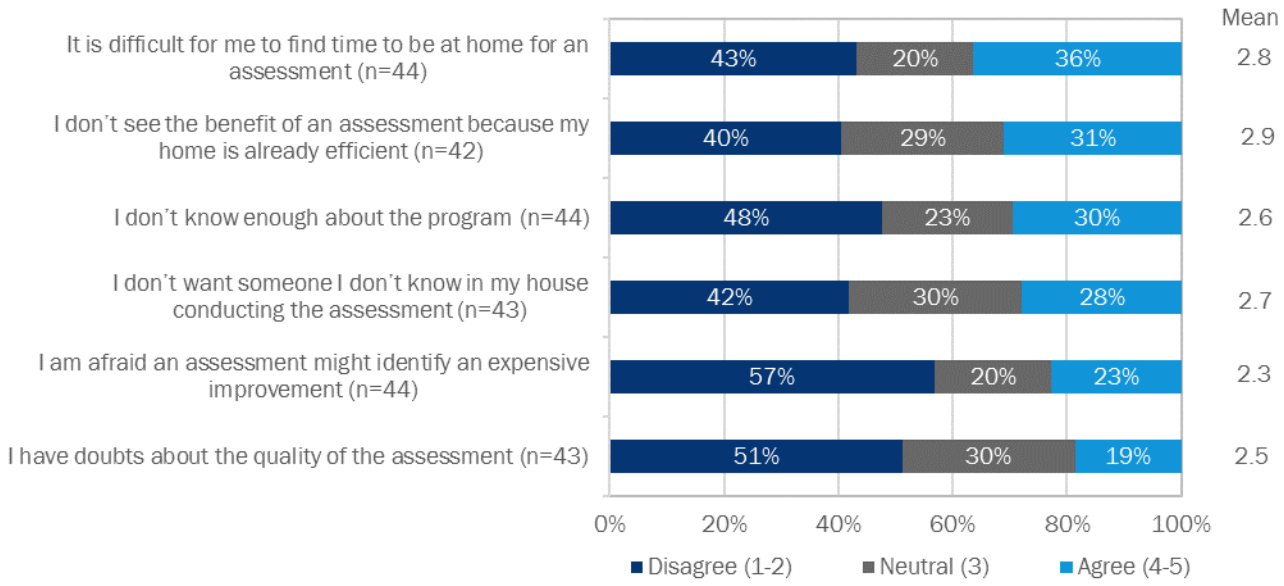
Overall, 82% of EneryWise non-participants agree and one half (50%) very much agree with at least one of the barrier statements. However, the specific barriers vary. Non-participants most often agree with the statement "It is difficult for me to find time to be at home for an assessment" (36%) and "I don't see the benefit of an assessment because my home is already efficient" (31%). Not knowing enough about the program (30% agreement) and not wanting a stranger in their house (28% agreement) are also frequently cited barriers. Fewer non-participants are concerned about discovering expensive improvements (23% agreement) or the quality of the assessment (19% agreement).

Average ratings for the various barriers range from 2.3 to 2.9 (out of a maximum of 5).

[3] A rating of 4 or 5 on a 5-point scale, where 0 means "not at all likely" and 5 means "very likely".

[4] "Low likelihood to participate" is defined as a likelihood rating of less than 4 or a "Don't Know" response.

Figure 2-5. Barriers to EnergyWise Participation



Source: Marketing Effectiveness Survey

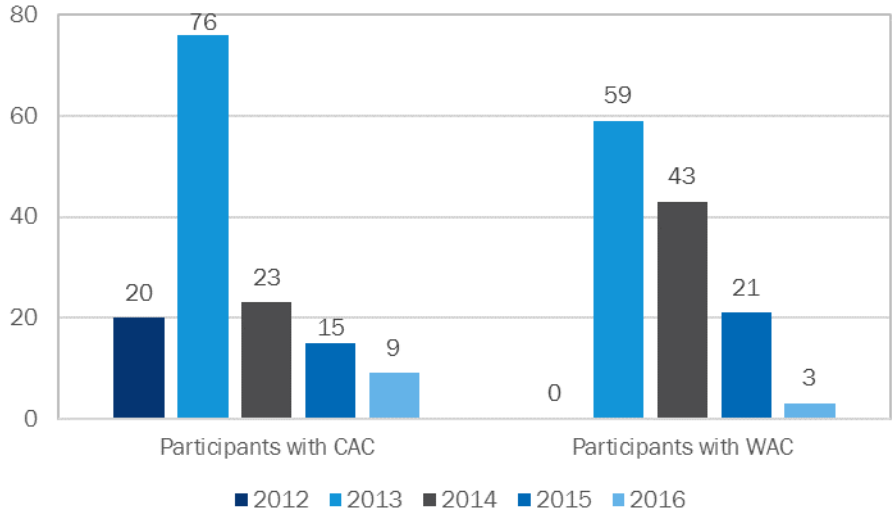
2.3 DemandLink Thermostat Program

Participation

In 2016, 12 new participants signed up to participate in the DemandLink Thermostat Program (9 with central AC and 3 with window AC) bringing the cumulative total to 269 substation participants. All nine new participants with central AC enrolled in the pilot through the Connected Solutions Program. In total, participants with central AC installed 13 thermostats (an average of 1.4 per home) and participants with window AC installed 8 plug devices (an average of 2.7 per home). These participation levels represent a further drop from prior years and are short of the 2016 planning projections of 50 thermostats among central AC users and 60 plug devices among window AC users. However, it should be noted that the program discontinued installation of plug devices in 2016, due to connectivity issues and the resulting low demand response event participation observed in 2014 and 2015.

Figure 2-6 summarizes annual participation in the DemandLink thermostat program component, by type of AC unit and first year of participation.

Figure 2-6. DemandLink Thermostat Program Participation in SRP Pilot Communities (2012 -2016)

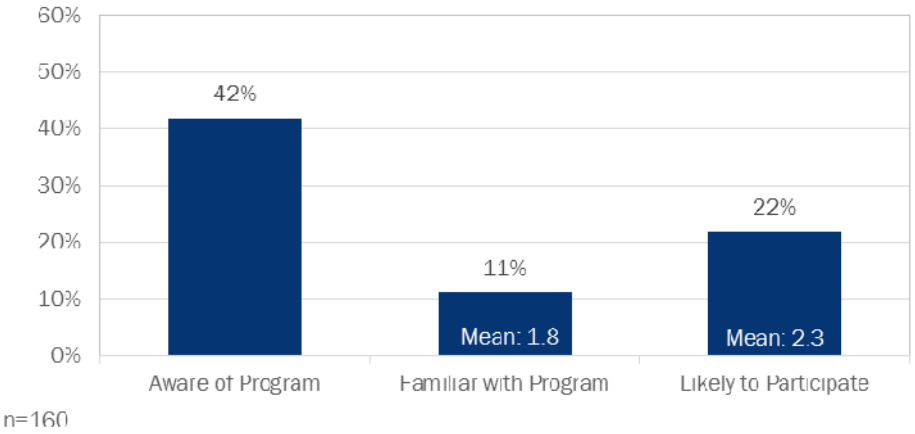


Source: Program Tracking Data

Awareness and Interest

General awareness of the DemandLink Program is robust among those who have not yet participated in the program (but significantly lower than awareness in the EnergyWise Program) but the level of familiarity is low: Fewer than half of non-participants (42%) are aware of the program and only 11% are familiar with it.[5] Just under a quarter of those who have not participated (22%) report that they are likely[6] to do so in 2017.

Figure 2-7. Awareness and Interest in DemandLink Program (Non-Participants)



Source: Marketing Effectiveness Survey

[5] A rating of 4 or 5 on a 5-point scale, where 0 means "not at all familiar" and 5 means "very familiar".

[6] A rating of 4 or 5 on a 5-point scale, where 0 means "not at all likely" and 5 means "very likely".

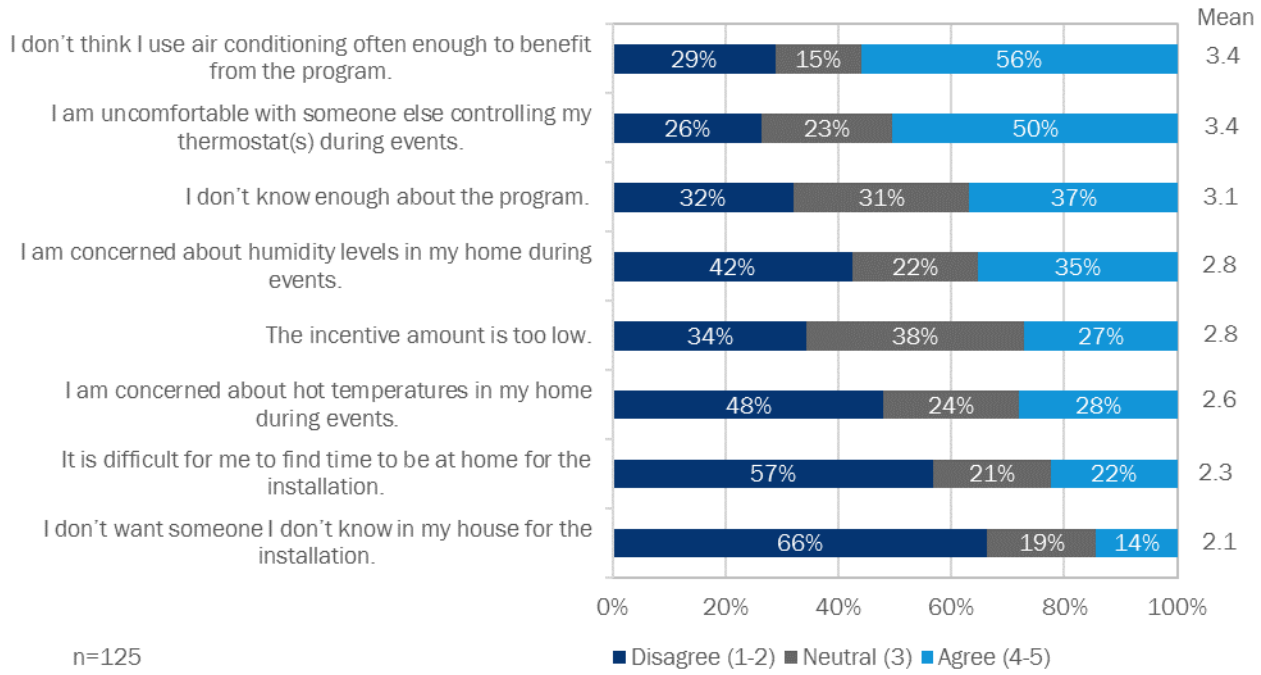
Barriers to Participation

DemandLink non-participants who indicated a low likelihood to participate in the program in 2017[7] were asked to rate their level of agreement with a series of statements regarding barriers to participation. A rating of 4 or 5 on a 5-point scale (where 1 means "very much disagree" and 5 means "very much agree") is defined as agreement while a rating of 1 or 2 is defined as disagreement.

Overall, 93% of DemandLink non-participants agree and 74% very much agree with at least one of the barrier statements. The perception that they do not use air conditioning enough (56% agreement) and being uncomfortable with someone else controlling their air conditioning (50%) were the barriers most often cited. In addition, more than a third of DemandLink non-participants agree with the statements, "I don't know enough about the program" (37%) and "I am concerned about humidity levels in my home during events" (35%).

Average ratings for the various barriers range from 2.3 to 2.9 (out of a maximum of 5).

Figure 2-8. Barriers to DemandLink Participation



Source: Marketing Effectiveness Survey

In addition to the barriers explored in the agreement statements, respondents cited equipment issues as an additional barrier: 13% of DemandLink non-participants do not use any air conditioning, and 10% do not have equipment that would make participation possible, or beneficial (e.g., wireless internet, a Smartphone, or a Smart thermostat-compatible heating system.

[7] "Low likelihood to participate" is defined as a likelihood rating of less than 4 or a "Don't Know" response.

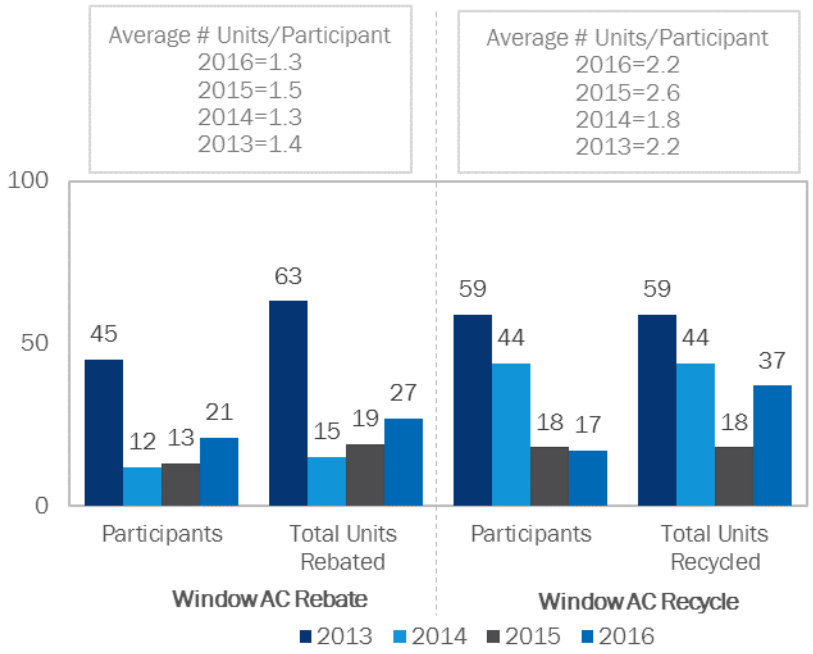
2.4 Window AC Rebate Program

Participation

In 2016, National Grid offered a $50 rebate for the purchase of up to four qualifying new window AC units and a $25 rebate for recycling up to four old units. These rebates were offered between May 1st and November 1st.

Overall, 32 unique customers in the pilot area received window AC rebates in 2016, installing 27 new ENERGY STAR® units and recycling 37 old units. Figure 2-9 shows participation and equipment counts in the pilot area between 2013 and 2016. Equipment counts for both types of rebate increased in 2016 compared with 2015.

Figure 2-9. Window AC Rebate Participation in SRP Pilot Communities (2013-2016)



Awareness and Interest

Applicability of the window AC rebates is limited to customers who have window AC units or are planning to use them during the summer. The Marketing Effectiveness Survey explored awareness of and interest in the window AC rebates among this subset of customers.

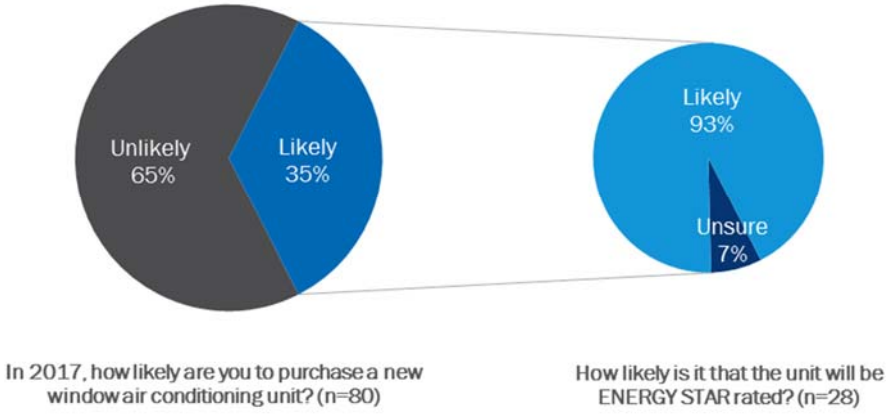
Window AC Purchase Rebate

Based on survey responses, the potential customer base eligible to receive a rebate for purchasing a new window AC unit is quite large: Almost 4 out of 10 customers (39%) use or plan to use window AC to cool their home in the summer, and 35% of those window AC users (or 14% of all customers) are likely[8] to purchase a

[8] A rating of 3 or greater on a 5-point scale, where 1 means "not at all likely" and 5 mean "very likely".

new window AC unit in 2017. A large majority of these likely buyers (93%) reported that they are likely to purchase an ENERGY STAR® rated model and apply for a rebate from National Grid.

Figure 2-10. Likelihood of ENERGY STAR® Window Air Conditioner Rebate Participation in 2017



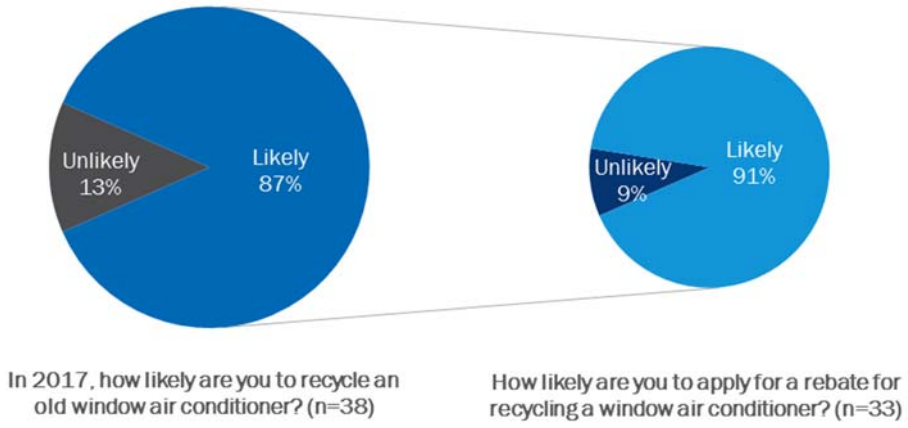
Source: Marketing Effectiveness Survey

However, more than half (57%) of window AC users who have not yet received a window AC rebate from National Grid, were unaware of the available rebates prior to taking the survey.

Window AC Recycling Rebate

Only 19% of customers have window AC units that they no longer use or that they might replace in 2017. Of these, a large majority (87%) are likely[9] to recycle an old unit, and nearly all of these likely recyclers (91%) reported that they are likely to apply for a rebate from National Grid for doing so.

Figure 2-11. Likelihood of Window AC Recycling Rebate Participation in 2017



Source: Marketing Effectiveness Survey

[9] A rating of 3 or greater on a 5-point scale, where 1 means "not at all likely" and 5 mean "very likely".

Awareness of the rebate for recycling window AC units is lower than awareness of the purchase rebate: More than 7 in 10 (71%) of window AC users who have not yet received a window AC rebate from National Grid, were unaware of the available rebates prior to taking the survey.

2.5 Heat Pump Water Heater Program

Participation

2016 was the second year that the pilot offered a $350 rebate for the purchase of an ulta-efficient electric HPWH, which could be combined with a rebate of $750 offered by the state. To be eligible for the rebate, customers have to participate in the DemandLink thermostat program. Overall, 17 DemandLink customers received a rebate for installing an electric HPWH in 2016, a significant increase from the 10 customers who participated in 2015.

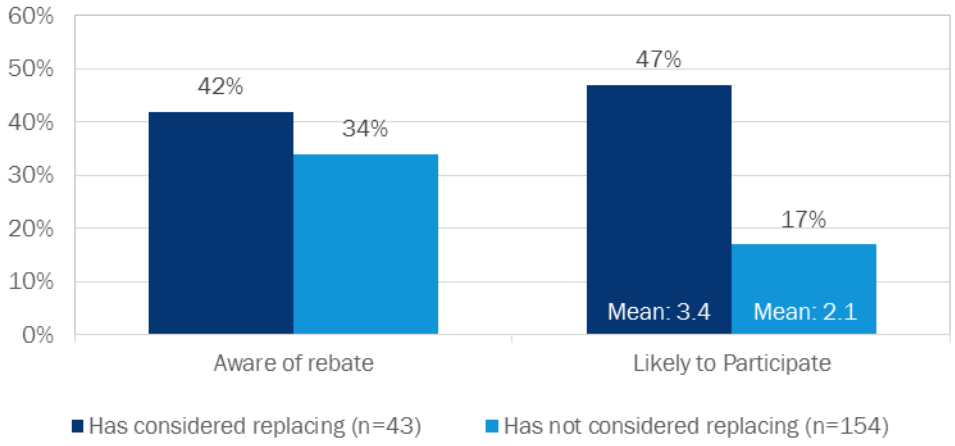
Awareness and Interest

The Marketing Effectiveness Survey explored awareness of and interest in the rebate for purchasing a HPWH among substation customers who own their home and have not yet participated in the program.

Given that the HPWH rebate is a relatively new offering for the pilot, non-participating homeowners report a relatively high awareness of the rebate (36%) and likelihood[10] to purchase a new HPWH through the program (38%). Not surprisingly, those who had previously considered replacing their current water heater (22% of non-participating homeowners) have higher levels of awareness and a significantly higher likelihood to participate than those who had not considering doing so (78% of non-participating homeowners). Still, nearly a two out of five (17%) of those who had not considered replacing their water heater prior to completing the survey indicate that they are likely to participate in the program.

Figure 2-12 compares awareness and likelihood responses of those who have and have not considered replacing their current water heater.

Figure 2-12. Awareness and Interest in HPWH Rebates (Non-Participants)



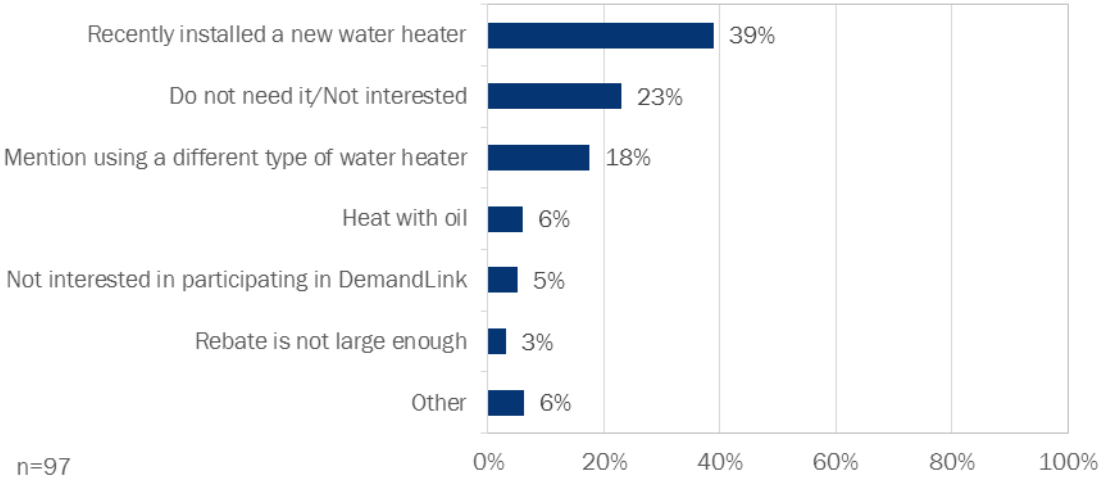
Source: Marketing Effectiveness Survey

[10] A rating of 3 or greater on a 5-point scale, where 1 means "not at all likely" and 5 mean "very likely".

Barriers to Participation

Non-participating homeowners who indicated a low likelihood[11] to participate in the program in 2017 were asked why they were unlikely to do so. More than a third of these customers have recently installed a new water heater (39%) and nearly another quarter (23%) are simply not interested or do not feel that they need a new water heater. Another 17% indicate they use a different type of water heater and are not interested in switching.

Figure 2-13. Barriers to HPWH Rebate Participation



Source: Marketing Effectiveness Survey

[11] A rating of 1 or 2 on the 5-point scale, where 1 means "not at all likely" and 5 mean "very likely".

3. EnergyWise Impact Analysis

This section presents evaluation results for the EnergyWise Program. The 2016 evaluation included two analyses, presented in this section:

- Development of ex ante gross load impacts from the installation of EnergyWise measures
- Development of ex ante net load impacts from the installation of EnergyWise measures

3.1 EnergyWise Gross Impact Analysis

To determine the gross load impacts in the SRP pilot area from the installation of EnergyWise Program measures, we applied National Grid's 2016 Rhode Island-specific impact factors to the quantity of measures installed during the pilot period (March 2012 through December 2016), using the following formula:

*Peak Load Reduction (kW) = Quantity * per Unit kW Reduction * Summer Diversity Factor*

Table 3-1 shows the quantities and resulting peak kW load impacts for all installations in the pilot area during each year of the pilot period as well as for the pilot-to-date. Total impacts for 2016 installations are 39.8 kW, a 53% decrease relative to the 84.0 kW estimated for 2015 installations.[12] LED installations continue to dominate, both in terms of the quantity of measures installed (89%) and demand savings (83%). However, LED installations declined by over 50% relative to 2015. Smart strips, accounted for the second largest amount of 2016 load impacts (10%). All other measures accounted for 2% of impacts or less.

Total cumulative gross impacts for the pilot-to-date are 253.5 kW.

[12] Note that 2012, 2013, 2014 and 2015 impacts have been re-estimated using 2016 impact factors. The results for these years, presented in this table, are therefore different from those presented in Opinion Dynamics Corporation's report *2015 Annual Evaluation Report*, completed in 2016.

Table 3-1. Energy Wise Installed Measures and Ex Ante Gross Peak Load Reduction: March 2012-2016

Measure Category	Total Measure Quantity [a]						Total Peak Load Reduction (kW)					
	2012 [b]	2013	2014	2015	2016	Pilot to Date	2012 [b]	2013	2014	2015	2016	Pilot to Date
LED Bulb	87	998	3,946	10,973	5,060	21,064	0.6	6.5	25.6	71.3	32.9	136.9
CFL	2,382	8,670	1,867	233	47	13,199	13.6	49.6	10.7	1.3	0.3	75.5
Indoor Fixture	24	95	25	13	18	175	0.2	0.9	0.2	0.1	0.2	1.6
Torchiere	4	1	-	2	-	7	<0.1	<0.1	-	<0.1	-	0.1
Outdoor Fixture	1	11	26	19	31	88	-	-	-	-	-	-
Smart Strip	60	539	363	568	347	1,877	0.7	6.3	4.2	6.6	4.1	21.9
Refrigerator Brush	103	297	191	253	158	1,002	0.5	1.5	1.0	1.3	0.8	5.0
Refrigerator Rebate	3	6	5	4	2	20	0.3	0.6	0.5	0.4	0.2	1.9
Programmable Thermostat (all fuels)	5	41	18	32	25	121	0.2	1.5	1.2	1.2	0.9	4.9
Weatherization (all fuels)[a]	-	31	27	25	11	94	-	1.4	1.2	1.5	0.5	4.7
Ventilation – Other [a]	-	28	23	19	5	75	-	-	-	-	-	-
AC Timer	-	-	1	-	-	1	-	-	-	-	-	-
Aerator	-	65	-	-	3	68	-	0.5	-	-	<0.1	0.5
HPWH 50 Gallon	-	1	-	-	-	1	-	0.2	-	-	-	0.2
DHW Pipe Wrap/Insulation	-	3	12	21	-	36	-	<0.1	<0.1	0.1	-	0.1
Low Flow Showerhead	-	3	3	7	-	13	-	<0.1	<0.1	0.1	-	0.1
TOTAL	2,669	10,789	6,507	12,169	5,707	37,841	16.1	68.9	44.7	84.0	39.8	253.5

[a] Quantities of Ventilation and Weatherization are the accounts of unique participants. All other quantities are measure counts (e.g., count of installed bulbs).

[b] 2012 participation period is between 3/1/2012 and 12/31/2012.

It should be noted that the gross load impact analysis presented above simply applies measure counts to load factors used by National Grid; it does not include a review of the reasonableness of the load factors themselves nor a verification of measure installation and persistence. As such, these gross load impacts should be considered ex ante impacts, rather than ex post impacts.

3.2 EnergyWise Net Impact Analysis

The goal of the net impact analysis is to quantify the influence of the SRP pilot on customers' decisions to participate in the EnergyWise Program. To assess net peak load impacts, we apply a "take rate" to represent the proportion of EnergyWise savings that would not have occurred without incremental SRP marketing efforts.

It should be noted that the take rate applied in this analysis is based on the evaluation of the 2015 program year, which assessed the take rate for the EnergyWise Program between March 2012 and December 2015.[13] The 2015 evaluation developed the take rate based on two components:

1. **Incremental EnergyWise Participation Rate.** We first estimated the incremental EnergyWise participation rate among pilot area customers relative to (a) past participants and (b) participants in nearby communities. We conducted a database analysis of historical and SRP pilot period participation in the EnergyWise Program, to compare participation rates in SRP communities and comparison communities.

2. **SRP Attribution.** We then estimated SRP attribution based on responses to the EnergyWise participant survey. We fielded several waves of an online survey among participants in the EnergyWise Program between 2012 and 2015. The survey collected information on participants' recall of SRP and statewide marketing efforts and the influence of those materials on customer participation. Based on survey responses, we estimated the level of influence of SRP pilot efforts on participation.

We then combined the incremental participation rate and the SRP attribution to determine the overall SRP take rate. This take rate can then be applied to the estimated gross impacts to develop net impacts.

The take rate estimated in the evaluation of the 2015 program year was 51%, which is the mid-point between SRP attribution based on the incremental participation rate (54%) and the EnergyWise surveys (47%). Applying the two rates to the measure-level gross impacts presented in Section 3.1, we estimate that the pilot-to-date has achieved net peak load savings totaling 128.5 kW, with a range of 118.7 to 138.2 kW. Table 3-2 presents the impact ranges for each measure category and the program overall.

[13] Opinion Dynamics Corporation. *National Grid Rhode Island System Reliability Procurement Pilot: 2015 Annual Evaluation Report*. August 3, 2016. Section 2.3.

Table 3-2. 2012-2016 EnergyWise Incremental Load Impacts by Measure Category

Measure Category	3/1/2012 - 12/31/2016	
	Incremental Peak Load Reduction (kW)	Range (kW)
LED Bulbs	69.4	64.1 - 74.7
CFL	38.3	35.4 - 41.2
Indoor Fixtures	0.8	0.8 - 0.9
Torchiere	<0.1	<0.1 - <0.1
Outdoor Fixture	--	--
Smart Strip	11.1	10.3 - 12
Refrigerator Brush	2.5	2.3 - 2.7
Refrigerator Rebate	1.0	0.9 - 1
Programmable Thermostat	2.5	2.3 - 2.7
Weatherization (multiple fuels)	2.4	2.2 - 2.6
Ventilation – Other	--	--
AC Timer	--	--
Aerator	0.2	0.2 - 0.2
HPWH 50 Gallon	0.1	0.1 - 0.1
DHW Pipe Wrap/Insulation	0.1	0.1 - 0.1
Low Flow Showerhead	<0.1	<0.1 - <0.1
TOTAL	128.5	118.7 - 138.2

4. DemandLink Demand Response Event Analysis

This section presents evaluation results for the DemandLink WiFi Thermostat and plug device components of the SRP pilot. The 2016 evaluation included the following analyses, presented in this section:

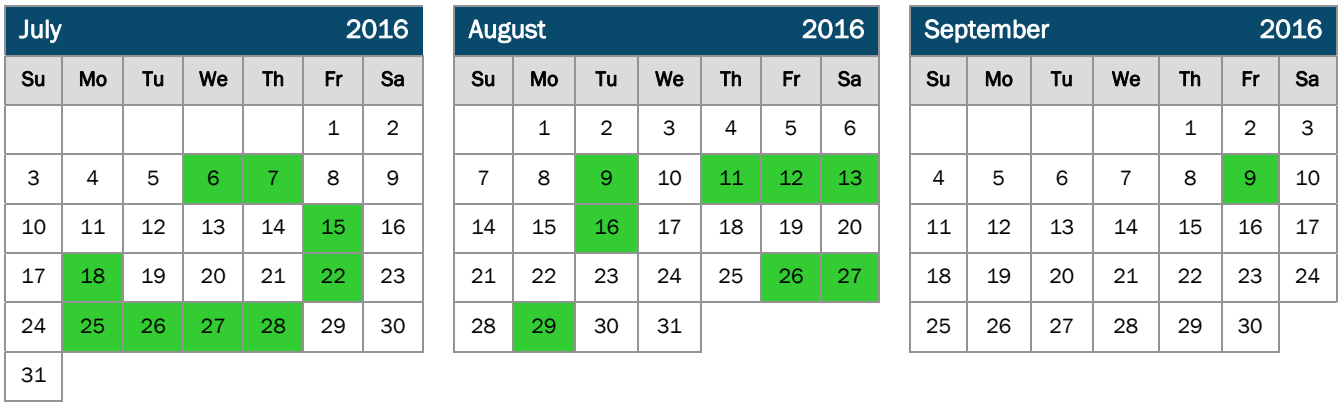
- An analysis of demand response event participation, based on thermostat log files
- Analyses of demand response event impacts for customers with central AC and window AC
- An analysis of event experience based on our Demand Response Event Follow-up Survey

Appendix B presents additional detail on the DemandLink demand response impact analysis.

4.1 Analysis of Demand Response Event Participation

National Grid called a total of 18 demand response events during the 2016 summer peak season (see Figure 4-1 below). Events lasted from 3 p.m. to 7 p.m. for central AC units and from 4 p.m. to 6 p.m. for window AC units. For central AC, setpoints were increased by 2°F; for window AC, the unit was shut off for the duration of the event.

Figure 4-1. 2016 Demand Response Events



July 2016						
Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

August 2016						
Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

September 2016						
Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

To determine participation in these 18 events and to support the impact analysis of the 2016 demand response events, Opinion Dynamics analyzed thermostat log files for the June through September peak season. The following sections summarize this analysis for central AC thermostats and window AC thermostats, respectively.

4.1.1 Log File Analysis for Thermostats Controlling Central AC

For each event, we assigned each central AC thermostat to one of the following categories:

1. **Log file is missing:** We did not receive the log file from Ecobee.
2. **Log file contains no data:** We received a log file that covers the day of the event, but the file does not contain any data for the event. This category includes files that have empty runtime fields or zero (or near zero) runtime across all events. These thermostats were excluded from our impact analysis.
3. **Log file has usable data:** The log files in this category indicate that the central AC was connected to the customer's Wi-Fi and was able to participate in events. On a given event day, a thermostat with usable data can fall into one of the following categories:

a. ***No load to drop:*** The log file shows that the unit was not running prior to the event, i.e., there was no load to drop.

b. ***Event failure:*** We define "event failure" as cases where a thermostat does not respond to the event. This can occur because the thermostat is offline or because the thermostat did not receive the signal to begin the event.

c. ***Event opt-out:*** We define an event "opt-out" if the thermostat received the event signal, but the setting switched out of event mode *and* the AC unit began cooling before the end of the event (the latter condition avoids flagging customers as an opt-out if they *raised* their temperature set-point during the event).

d. ***Event participant:*** The log file shows that the unit was running before the event and that the thermostat received the event signal. The log file shows an increase in temperature settings and there is no indication that the customer overrode the event, i.e., that they opted-out of the event.

Based on program tracking data, 208 thermostats controlling central AC units were in place in the pilot area during the 2016 event season. We received no log files for 36 of these 208 thermostats (17%); for an additional 28 thermostats (13%), we only received log files for August and September, but not for July. Our analysis of the log files we received shows the following:

- A number of log files (27 for July events, 29 for August/September events) contained no data or only zeroes (indicating that the central AC unit was only used for a couple of days or that the thermostat was malfunctioning). These thermostats were dropped from the analysis, leaving 117 thermostats for July events and 143 thermostats for August/September events to be included in our central AC demand response event analysis.
- On average, 13 log files per event showed only zero values before and during the event, meaning the AC was not running and there was no load to drop.
- On average, 11 thermostats per event experienced event failure. The majority of these did not receive a signal; only a handful (between 0 and 6 in a given event) were offline.
- On average, 15 thermostats opted out per event. The number of opt-outs in any event ranged from 7 to 25, representing between 3% and 12% of all installed central AC thermostats. Expressed as a percentage of those who had load to drop and received the event signal, opt-outs ranged from 7% to 22% with an average of 14%.
- Between 80 and 99 thermostats participated in each event, representing between 38% and 48% of all installed central AC thermostats.

Thermostats with the following statuses were included in or demand response event analysis, described in Section 4.2.1: event failure – no signal, event opt-out, and event participant. Thermostats with missing log files, with log files that contained no usable data, with only zero values, or offline were excluded from the demand response event analysis, at the event level.

Table 4-1 summarizes our central AC log file analysis, by event.

Table 4-1. Summary of Central AC Log File Analysis

Event	Missing Log File		Log File with No Data		Only Zero Values		Event Failure				Event Opt-out		Event Participant	
							Offline		No Signal					
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
1	64	31%	27	13%	14	7%	-	0%	2	1%	10	5%	91	44%
2	64	31%	27	13%	15	7%	-	0%	1	0.5%	7	3%	94	45%
3	64	31%	27	13%	5	2%	-	0%	5	2%	15	7%	92	44%
4	64	31%	27	13%	7	3%	1	0.5%	3	1%	9	4%	97	47%
5	64	31%	27	13%	13	6%	1	0.5%	5	2%	18	9%	80	38%
6	64	31%	27	13%	12	6%	2	1%	4	2%	8	4%	91	44%
7	64	31%	27	13%	8	4%	2	1%	6	3%	10	5%	91	44%
8	64	31%	27	13%	9	4%	2	1%	2	1%	12	6%	92	44%
9	64	31%	27	13%	9	4%	2	1%	4	2%	11	5%	91	44%
10	36	17%	29	14%	28	13%	1	0.5%	11	5%	15	7%	88	42%
11	36	17%	29	14%	14	7%	1	0.5%	14	7%	17	8%	97	47%
12	36	17%	29	14%	12	6%	2	1%	13	6%	24	12%	92	44%
13	36	17%	29	14%	7	3%	2	1%	13	6%	22	11%	99	48%
14	36	17%	29	14%	11	5%	5	2%	13	6%	25	12%	89	43%
15	36	17%	29	14%	15	7%	3	1%	12	6%	23	11%	90	43%
16	36	17%	29	14%	15	7%	3	1%	15	7%	20	10%	90	43%
17	36	17%	29	14%	23	11%	4	2%	16	8%	10	5%	90	43%
18	36	17%	29	14%	16	8%	6	3%	13	6%	22	11%	86	41%
Mean	**50**	**24%**	**28**	**13%**	**13**	**6%**	**2**	**1%**	**8**	**4%**	**15**	**7%**	**91**	**44%**

4.1.2 Log File Analysis for Thermostats Controlling Window AC

For each event, we assigned each window AC thermostat to one of the following categories:

1. **Log file is missing:** We did not receive the log file from Ecobee.
2. **Log file contains no data:** We received a log file that covers the day of the event, but the file does not contain any data for the event. This category includes files that are either missing the field(s) that contain plug usage or that have the plug usage field(s) but they are empty. In addition, this category includes files that are missing records during the event (i.e., there is a data gap).
3. **Log file has usable data:** The log files in this category have some data, suggesting that the unit is connected to the customer's Wi-Fi and is able to participate in events. On a given event day, a thermostat with usable data can fall into one of the following categories:
    a. ***No load to drop:*** The log file shows that the unit was not running prior to the event, i.e., there was no load to drop. This category also includes log files that show very small, non-zero plug usage values during the event, indicating that something other than a window AC was plugged into the plug device.
    b. ***Event failure:*** We define "event failure" as cases where a thermostat does not respond to the event. This can occur because the thermostat is offline or because the thermostat did not receive the signal to begin the event.

c. ***Event opt-out:*** For window AC thermostats, we define an event "opt-out" if the thermostat received the event signal, but the log file shows positive plug usage before the end of the event.

d. ***Event Participant:*** The log file shows that the unit was running before the event and that the thermostat received the event signal. The log file shows zero plug usage for the duration of the event.

Based on program tracking data, 158 thermostats controlling window AC units were in place in the pilot area during the 2016 event season. We received no log files for 36 of these 158 thermostats (23%); for an additional 44 thermostats (28%), we only received log files for August and September, but not for July. Our analysis of the log files we received shows the following:

July Events (Events 1 through 9)

- None of the 78 log files received for the July events (Events 1 through 9) contained any data. In most of these log files, the fields that contain plug usage were missing; in a few cases, a header for one or more plug usage fields was present, but the field(s) contained no data.
- Given these findings, we cannot verify that any plug devices participated in July events. The demand response savings from these events are therefore assumed to be zero.

August/September Events (Events 10 through 18)

- For all August and September events, either 107 or 108 of the 122 log files received (88-89%, or 68% of all window AC thermostats) contained no data. Similar to the July events, in most cases there the plug usage fields were missing; in a few cases, a header for one or more plug usage fields was present, but the field(s) contained no data.
- The remaining files, representing between 9% and 10% of all window AC thermostats, contained mostly zero values. Two thermostats had non-zero values that were too small to be a window AC, indicating that the participants had plugged something other than a window AC into the plug device. Only one of the 158 window AC thermostats (0.6%) showed plug usage data consistent with a window AC for seven out of the nine August/September events. This participant opted out of all seven events.
- Based on these results, we can verify demand response savings from an average of 0.8 thermostats for August and September events.[14]

Averaging findings from the July and August/September events, we can verify demand response savings from an average of 0.4 units per event.

Table 4-2 summarizes our window AC log file analysis, by event.

[14] We apply the per-unit event savings value to opt-outs because our 2014 and 2015 demand response analyses included opt-outs in developing the per-unit savings estimate. As such the per-unit savings value reflects both full participants and opt-outs and should be applied to both.

Table 4-2. Summary of Window AC Log File Analysis

Event	Missing Log File		Log File with No Data		Only Zero Values		Event Failure		Event Opt-out		Event Participant	
	#	%	#	%	#	%	#	%	#	%	#	%
1	80	51%	78	49%	-	0%	-	0%	-	0%	-	0%
2	80	51%	78	49%	-	0%	-	0%	-	0%	-	0%
3	80	51%	78	49%	-	0%	-	0%	-	0%	-	0%
4	80	51%	78	49%	-	0%	-	0%	-	0%	-	0%
5	80	51%	78	49%	-	0%	-	0%	-	0%	-	0%
6	80	51%	78	49%	-	0%	-	0%	-	0%	-	0%
7	80	51%	78	49%	-	0%	-	0%	-	0%	-	0%
8	80	51%	78	49%	-	0%	-	0%	-	0%	-	0%
9	80	51%	78	49%	-	0%	-	0%	-	0%	-	0%
Mean-July	*80*	*51%*	*78*	*49%*	-	*0%*	-	*0%*	-	*0%*	-	*0%*
10	36	23%	108	68%	14	9%	-	0%	-	0%	-	0%
11	36	23%	108	68%	13	8%	-	0%	1	0.6%	-	0%
12	36	23%	107	68%	14	9%	-	0%	1	0.6%	-	0%
13	36	23%	108	68%	13	8%	-	0%	1	0.6%	-	0%
14	36	23%	108	68%	13	8%	-	0%	1	0.6%	-	0%
15	36	23%	108	68%	13	8%	-	0%	1	0.6%	-	0%
16	36	23%	108	68%	13	8%	-	0%	1	0.6%	-	0%
17	36	23%	108	68%	14	9%	-	0%	-	0%	-	0%
18	36	23%	107	68%	14	9%	-	0%	1	0.6%	-	0%
Mean-Aug/Sep	*36*	*23%*	*108*	*68%*	*13*	*9%*	-	*0%*	*0.8*	*0.5%*	-	*0%*
Mean-Total	58	37%	93	59%	7	4%	-	0%	0.4	0.2%	-	0%

4.2 Demand Response Impact Analysis

4.2.1 Demand Response Impacts – Central Air Conditioning

This section presents the demand response impact results for participants with central AC. Table 4-3 presents the demand response impacts for the eighteen events called in 2016. Each event has between eight and thirteen matched comparison days that we used to develop the modeled baseline. Opinion Dynamics also estimated impacts for an overall event that uses data from all 18 events. Note that the result for the overall event is not a simple average of the eighteen single events. Rather, the baseline used to calculate the overall event impacts is slightly different than that used for each event because we included all comparison days in the model. As a result, the impact estimate is not exactly the same as if we had averaged the eighteen events. Estimated impacts for each event hour are presented later in this section.

Table 4-3. Central AC Demand Response Impact

	Per-Thermostat Impact		# of Participating Thermostats	Program Impact	Average Temperature During Event Hours
	Runtime Reduction	kW		kW	
Overall	**10.9%**	**0.40**	**115**	**46**	**81°F**
Wed 7/6	10.7%	0.40	103	41	82°F
Thur 7/7	15.1%	0.56	102	57	75°F
Fri 7/15	8.3%	0.31	112	34	83°F
Mon 7/18	17.8%	0.66	109	72	78°F
Fri 7/22	10.0%	0.37	103	38	78°F
Mon 7/25	14.4%	0.53	103	55	77°F
Tue 7/26	13.9%	0.51	107	55	89°F
Wed 7/27	15.1%	0.56	106	59	81°F
Thur 7/28	16.7%	0.62	106	65	80°F
Tues 8/9	14.1%	0.52	114	59	80°F
Thur 8/11	15.3%	0.57	128	72	82°F
Fri 8/12	13.8%	0.51	129	66	80°F
Sat 8/13	11.4%	0.42	134	56	83°F
Tue 8/16	16.2%	0.60	127	76	80°F
Fri 8/26	13.4%	0.50	125	62	82°F
Sat 8/27	10.5%	0.39	125	48	80°F
Mon 8/29	8.0%	0.30	116	34	86°F
Fri 9/9	9.7%	0.36	121	43	87°F

We used a linear fixed-effects regression modeling approach for the demand response impact analysis. The models estimate the percentage of hourly runtime on a per-thermostat level. Event savings are the mean difference between the baseline runtime and the event runtime over the event period multiplied by mean full load demand. We used an average estimate of full load central AC demand of 3.69 kW at full load to estimate the kW savings per thermostat. Not all thermostats had logs for all of the event periods, so we only applied savings for those thermostats where we could confirm operation. The program total impact is the product of the per-thermostat kW impact averaged over the event period and the number of participating thermostats. All operational thermostats were included in the model, including those who received no signal and those who opted out of the event. The impact estimates therefore include the effect of any participant opt-outs.

Opinion Dynamics calculated the full load kW demand for an average central AC unit in Rhode Island based on Equation 4-1 which uses deemed average equipment cooling capacity (in Btu per hour) and equipment efficiency (EER) values from the RI Technical Reference Manual (TRM). The resulting full load demand per central AC unit is 3,692 watts, or 3.69 kW.

Equation 4-1. Full Load kW for Central AC

$$Full\ load\ kW = Capacity / EER$$

Where:

Capacity = 3 tons or 36,000 Btu/hr[15]

EER (Btu/watt-hr) = 9.75[16]

Figure 4-2 depicts the hourly event usage and baseline usage for the overall average event. The event period shows significant runtime reduction, with a small snapback in the two hours after the event ends. The snapbacks are largely similar to those observed in 2015, and larger than those in 2014.

Figure 4-2. Overall Hourly Event Day Usage with Baseline

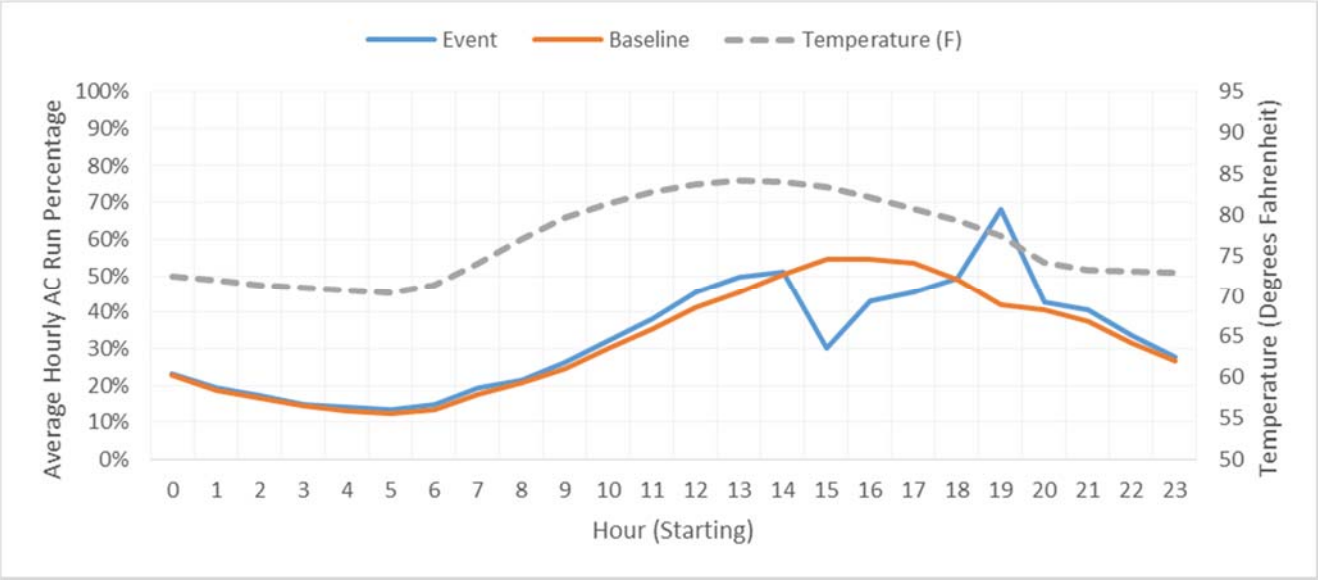


Figure 4-3, Figure 4-4, and Figure 4-5 show the runtime percentage along with the baseline used to calculate demand impact for three events of interest: one typical event with savings close to the overall average (Wednesday, July 7), the event with the highest savings (Monday, July 18), and the event with the lowest savings (Monday, August 29). In all three events, there is significant demand reduction during the event hours followed by a short snapback period of increased demand.

Although we cannot definitively explain the differences in savings across these three events with the available data, the differences in load curves shapes during the event periods are striking. Savings for the

[15] RI PY2014 TRM Central AC page M-25: Tons = deemed average equipment cooling capacity: 3 tons

[16] The RI PY2014 TRM has measures for traditional AC replacement (page M-25) and early replacement central AC replacement (M-40). The EER used for this analysis assumes an average (i.e., 9.75) between the baseline EER of new equipment (EER = 11: page M-25), and the baseline EER of early replacement equipment (EER = 8.5: page M-40). If we only used the current baseline of new equipment (EER 11) we would be underestimating savings since there are likely older pieces of equipment in use that do not meet current baseline requirements. If we assumed only the early replacement baseline (EER 8.5), we would likely be overestimating savings as there are likely newer pieces of equipment that have a higher efficiency. Taking the average appears to be a more accurate estimate and can be verified through future data collection efforts that analyze the exact capacity and efficiency of the units participating in the program.

August 29 event decrease sharply in the later hours of the event. This is surprising given that this event does not have an unusually high opt-out rate. Perhaps the more important question is not how many participants opted out, but what participants did *after* opting out. Did they simply return their thermostats to normal, or did they aggressively crank up their AC units?

Figure 4-3. Event 1, July 7th Hourly Usage with Baseline (Typical Event)

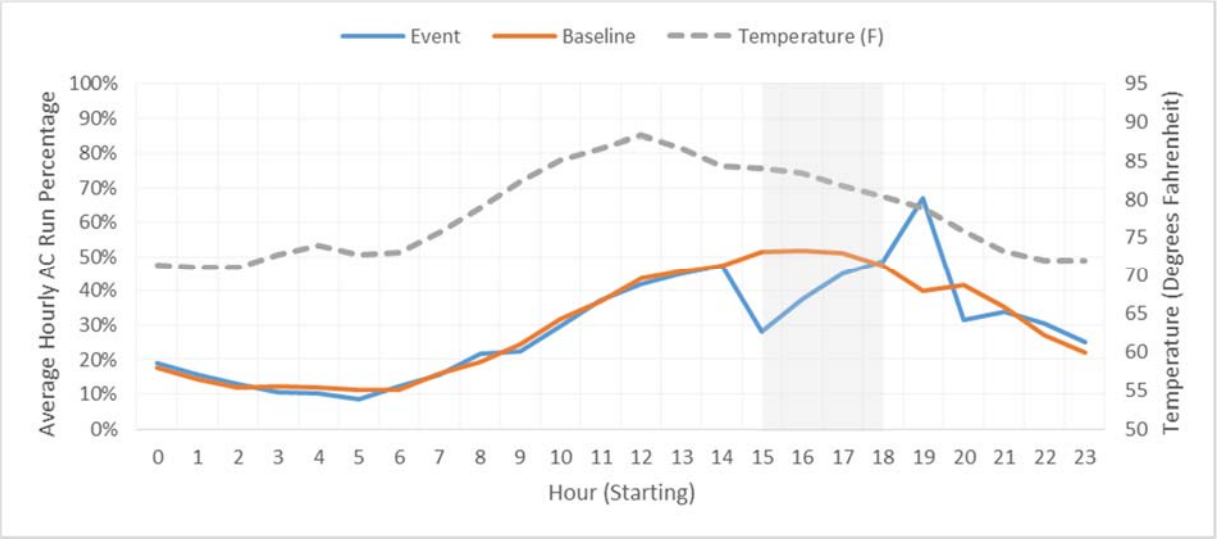


Figure 4-4. Event 4, July 18th Hourly Usage with Baseline

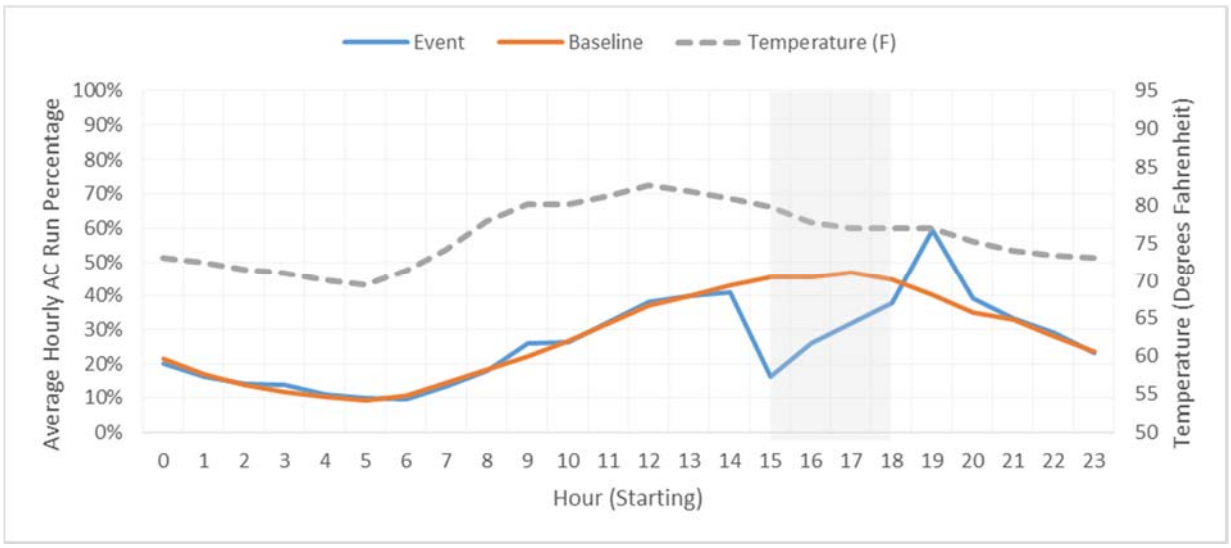
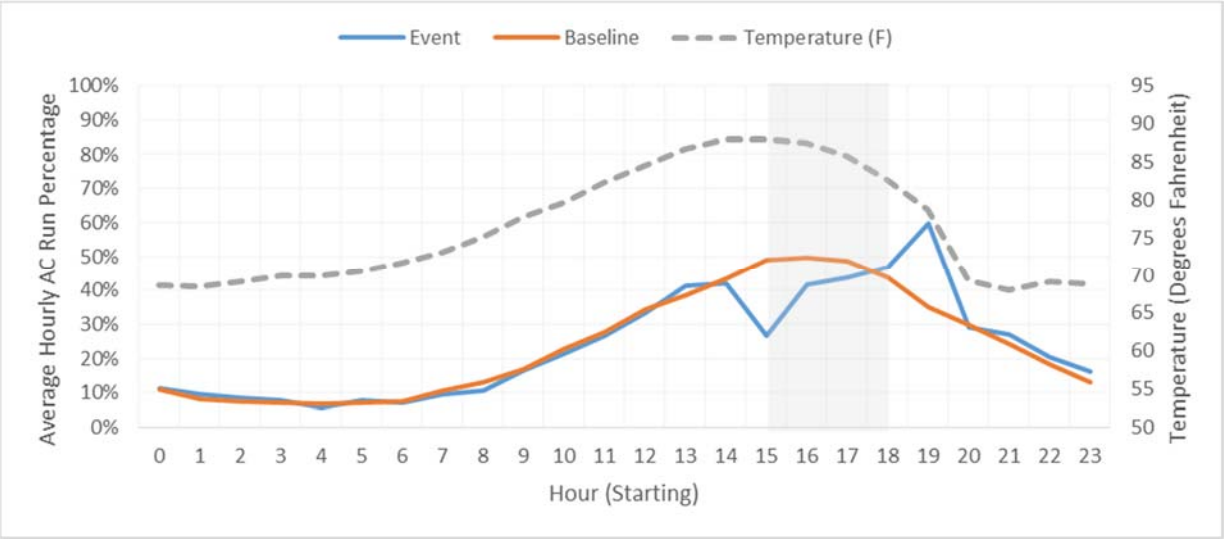


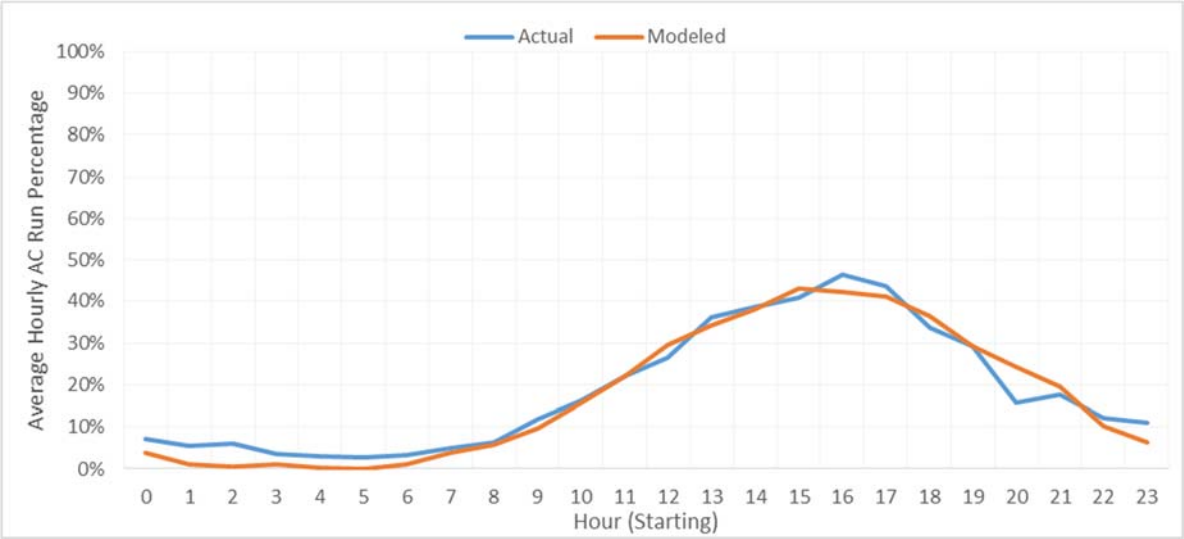
Figure 4-5. Event 17, August 29th Hourly Usage with Baseline



Model Validation

The primary method for evaluating the validity of a linear fixed effects model is to compare actual, logged run time to the baseline runtime predicted by the model. When actual and baseline are similar, especially on non-event days with weather similar to event days, it shows that the model is effectively estimating the baseline. The primary reason for the model is to estimate a baseline on event days, so matching non-event day usage is the best way to demonstrate model effectiveness. However, there was no single non-event day that truly approximated event day temperatures. Most event days had a rapid increase in temperature in the late morning, while the hottest non-event days were relatively hot all day. As a result, we validated the model using a combination of two days: one that was hot throughout and one that had a temperature increase comparable to that of an event day. Figure 4-6 shows the modeled baseline on a non-event day. The modeled baseline matches to within 3% of actual runtime. The close match of the modeled baseline and actual usage in the hours leading up to the event in Figure 4-2 increases our confidence that the model estimates baseline usage accurately.

Figure 4-6. Non-event Day Baseline versus Actual AC Run Percentage



Hourly Event Results

The table below provides hourly per-thermostat savings estimates and standard errors (SE) for each of the 18 2016 demand response events. As is often the case with demand response programs, the first hour of the event achieved the highest savings, with an average of 0.91 kW across all events. Each subsequent event hour achieved smaller savings. The largest instantaneous per-thermostat reduction of the 2016 season occurred during the first hour of Event 8. During that hour, the average load reduction by central AC thermostats was 1.20 kW. Notably, hourly savings for the fourth event hour were zero across all 18 events, with several events achieving negative savings.

Table 4-4. Hourly DemandLink Impact Results

Event	Date	Time	Hour 1		Hour 2		Hour 3		Hour 4	
			kW	*SE*	kW	*SE*	kW	*SE*	kW	*SE*
Overall			**0.91**	**0.10**	**0.42**	**0.11**	**0.30**	**0.10**	**-0.01**	**0.09**
1	Wed 7/6	3-7pm	0.87	0.12	0.53	0.13	0.22	0.12	-0.04	0.11
2	Thur 7/7	3-7pm	0.76	0.13	0.64	0.12	0.63	0.10	0.21	0.10
3	Fri 7/15	3-7pm	0.82	0.13	0.30	0.13	0.28	0.12	-0.16	0.11
4	Mon 7/18	3-7pm	1.09	0.10	0.73	0.10	0.56	0.11	0.26	0.11
5	Fri 7/22	3-7pm	0.81	0.13	0.39	0.12	0.28	0.13	0.01	0.12
6	Mon 7/25	3-7pm	0.87	0.13	0.59	0.12	0.40	0.11	0.27	0.11
7	Tue 7/26	3-7pm	1.15	0.13	0.56	0.13	0.31	0.13	0.02	0.13
8	Wed 7/27	3-7pm	1.20	0.10	0.64	0.11	0.36	0.12	0.04	0.12
9	Thur 7/28	3-7pm	1.11	0.12	0.61	0.12	0.54	0.12	0.20	0.11
10	Tues 8/9	3-7pm	0.92	0.12	0.54	0.12	0.53	0.12	0.08	0.11
11	Thur 8/11	3-7pm	1.12	0.10	0.65	0.11	0.44	0.11	0.05	0.10
12	Fri 8/12	3-7pm	0.84	0.11	0.39	0.11	0.53	0.10	0.29	0.10
13	Sat 8/13	3-7pm	0.83	0.12	0.39	0.11	0.34	0.11	0.13	0.11
14	Tue 8/16	3-7pm	1.16	0.09	0.64	0.10	0.43	0.10	0.17	0.10

Event	Date	Time	Hour 1		Hour 2		Hour 3		Hour 4	
			kW	*SE*	kW	*SE*	kW	*SE*	kW	*SE*
15	Fri 8/26	3-7pm	0.98	0.09	0.48	0.10	0.41	0.10	0.11	0.09
16	Sat 8/27	3-7pm	0.69	0.12	0.42	0.11	0.27	0.11	0.17	0.10
17	Mon 8/29	3-7pm	0.82	0.11	0.30	0.12	0.18	0.11	-0.12	0.11
18	Fri 9/9	3-7pm	0.82	0.13	0.34	0.14	0.19	0.14	0.10	0.12

4.2.2 Demand Response Impacts – Window Air Conditioning

Our 2014 and 2015 demand response impact analyses for window AC units were based on linear fixed effects models, similar to those used for the analyses for central AC events. However, due to the small number of operating window AC units, it was decided to forgo development of a new model for the 2016 evaluation and to instead apply per-unit savings values from the prior analyses to units that participated in 2016.

We developed a per-unit savings value for 2016 events by taking the average of 2014 and 2015 results, weighted by the number of events in each year. This approach represents a close approximation of likely results, had we combined the events of both years into one model. Using this approach, we estimate the 2016 per-thermostat demand savings to be 0.045 kW.

Table 4-5 presents the data for 2014 and 2015 and the resulting weighted average.

Table 4-5. Estimation of Per-Thermostat Reduction for 2016

	Per-Thermostat Reduction (kW)	Number of Events
2014	0.07	3
2015	0.04	15
Weighted Average	0.045	

As described in Section 4.1.2, based on the log files available for window AC thermostats, we estimate that, on average, 0.4 thermostats participated per 2016 event. Multiplying this value by the 2016 per-thermostat value of 0.045 kW yields demand response event savings for window AC units of 0.018 kW.

Table 4-6 summarizes these results.

Table 4-6. Window AC Demand Response Impact

	Per-Thermostat Reduction (kW)	Participating Thermostats	Program Impact (kW)
2016 Events	0.045	0.4	0.018

4.3 Demand Response Event Follow-Up Analysis

This section presents results from the Demand Response Event Follow-up Survey, conducted between August 30th and September 1st, following the SRP demand response event called on August 29th. The survey targeted all residential participants who were enrolled in the DemandLink controllable thermostat component during the 2016 cooling season. The survey focused on the following topics:

1. Verification of continued installation and use of the program-provided thermostat and plug devices (for customers with window air conditioning);

2. General awareness of event processes, including customer notification, bill credits, and opt-out option;

3. Participant experience during the August 29th event, including awareness of the event, whether the participant was at home during the event, whether they opted out, and the level of comfort (if they were at home); and

4. Overall recall of 2016 events and likelihood to participate in the future.

Overall, 52 SRP participants completed the event follow-up survey, including two who did not recall receiving the program-provided equipment. The following subsections summarize responses of the 50 participants who confirmed receiving the program-provided equipment. Of these 50 respondents, 28 use their thermostats to control central AC systems, 20 use their thermostats to control window AC units, and two use their thermostats to control both.[17]

4.3.1 Equipment Installation and Use

Overall, participants reported continued installation and use of the programmable thermostats during the 2016 cooling season. The 50 survey respondents received a total of 74 thermostats through the pilot. All but one of these thermostats (73, or 99%) were still installed during the August 29th demand response event. In addition, all 30 respondents with central AC reported using at least one of their thermostats to control their central AC system.

The 22 respondents with window AC received a total of 63 plug devices. Not surprisingly, these participants reported lower rates of installation and continued use of their plug devices. Of the 22 respondents:

- 36% (8 out of 22) had none of their plug devices installed during the August 29th demand response event.
- 64% (14 out of 22) had one or more plug device installed during the August 29th demand response event. Of these:
  - 86% (12 out of 14) used at least one of them to control a window AC unit;
  - 29% (4 out of 14) had something other than an AC unit plugged into at least one plug device, including computers, televisions, lamps, and powerstrips.
- 73% (16 out of 22) had one or more plug devices not in use during the August 29th event. Not having or not needing a window AC unit was the most common reason for not using a plug device with an AC unit, cited by 43% (7 out of 16). In addition, 18% (3 out of 16) of those not using the plug device to control their window AC cited connectivity or technical problems.

Of the 63 plug devices received by participants with window AC:

- 57% (36 out of 63) were not installed during the April 29th event.
- 43% (27 out of 63) were installed during the April 29th event. Of these:
  - 74% (20 out of 27) were used with a window AC unit;

[17] The two respondents who use their thermostats to control both window AC units and central AC systems are included in both air conditioning categories in the analyses that follow.

- 26% (7 out of 27) were used with something else.

- 68% (43 out of 63) were not in use or were used with something other than a window AC unit during the August 29th event. Of these:
  - 35% (15 out of 43) had been used with a window AC unit in a previous summer.

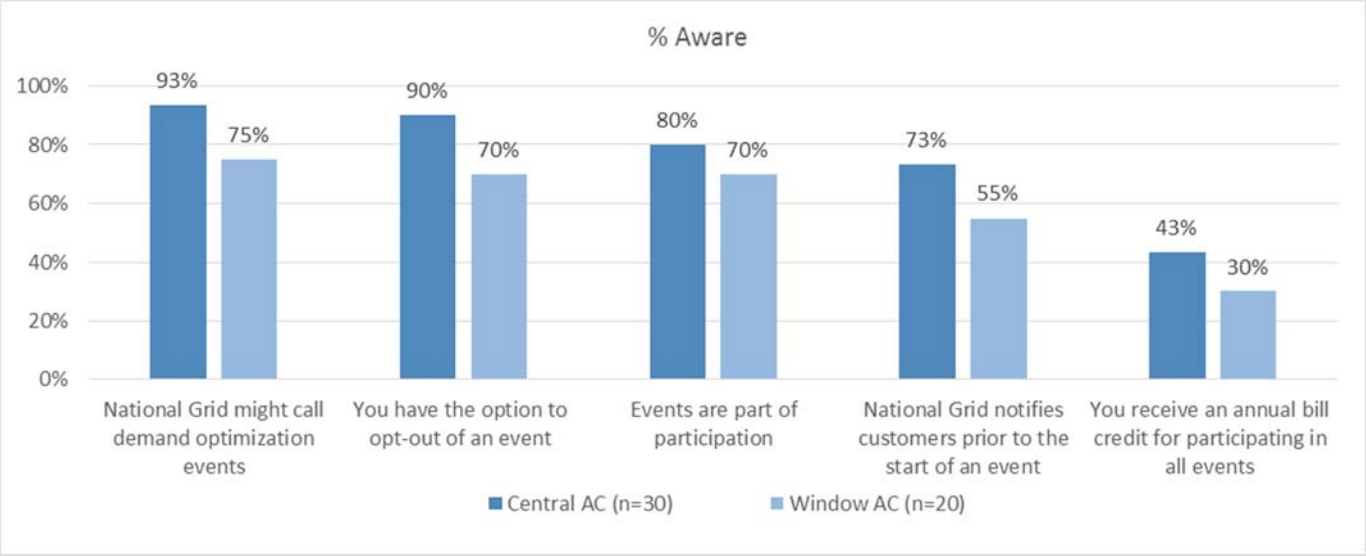
4.3.2 Awareness of Event Processes

Participants with central AC are highly aware of the various elements of the DemandLink Program, including that National Grid might call events (93%), that participants can opt out of events (90%), that events are part of program participation (80%), and that National Grid notifies participants before the start of each event (73%). In comparison, awareness of the annual bill credit for participation in all events is significantly lower (43%).

Awareness of the various program elements by participants with window AC follows the same patterns, with general awareness of events the highest (75%) and awareness of the bill credit the lowest (30%). However, for all elements, awareness of participants with window AC is lower compared to participants with central AC.[18]

Figure 4-7 summarizes responses to the questions about awareness of different DemandLink Program elements.

Figure 4-7. Awareness of Event Processes



Source: Demand Response Event Follow-Up Survey

The relatively low awareness of the annual bill credit for participation in all events is notable as it might be correlated with a higher likelihood to opt-out of an event (if participants consider the monetary reward important). While sample sizes are small, survey responses provide anecdotal evidence that such a

[18] At 90% confidence, the difference between the two groups is statistically significant for awareness that National Grid might call demand optimization events and awareness that participants can opt-out of the events.

correlation might exist: All three respondents who reported having opted out of the August 29th event (see discussion below) were unaware of the bill credit. Conversely, 67% of respondents who did not opt out of the event (12 out of 18) were aware of the annual bill credit.

For window AC participants, knowledge of demand response events seems to be correlated with using the plug devices with window AC units: All five respondents with window AC who were unaware of the events did not have a plug device installed; conversely, 87% respondents with window AC who were aware of demand optimization events (13 out of 15) reported using at least one plug device with their window AC.

4.3.3 Participant Experience during the August 29th Event

The analysis of participant event experience is based on respondents who used their devices to control their air conditioning at the time of the August 29th event (hereafter referred to as "event-eligible participants"). As summarized in Section 4.3.1, 30 participants with central AC and 12 participants with window AC met this criterion.

Awareness of the August 29th event among event-eligible participants was moderate: 57% of those with central AC and 50% of those with window AC were aware that the event had been called. Among event-eligible participants with central AC, close to half (47%) were home during the event and 10% reported having opted-out of the event, citing discomfort or anticipation of discomfort as the influencing factor. Among event-eligible respondents with window AC, only 17% (2 out of 12) were home during the event, and none opted out.

Table 4-7 summarizes rates of event awareness, home occupancy, and opt-outs for the August 29th event, by AC type.

Table 4-7. Window AC Demand Response Impact

	Central AC *(n=30)*		Window AC *(n=12)*	
	#	%	#	%
Participant was aware of August 29th event	17	57%	6	50%
Household was occupied during event	14	47%	2	17%
Participant opted out	3	10%	0	0%

Source: Demand Response Event Follow-Up Survey

Approximately two-thirds (11 out of 16) event-eligible participants who were both home during the August 29th event and aware of the event reported noticing at least some temperature difference, with 38% reporting that they definitely noticed the temperature changing (all 38% are central AC users). Among event-eligible respondents who were not aware of the August 29th event, more than half (10 out of 17) indicated that the home was occupied during the time of the event.[19] Unaware respondents who were home themselves during the event generally did not notice a change in temperature.

4.3.4 Overall Event Recall and Likelihood to Participate in Future Events

Over half of event-eligible participants (65%) recall National Grid calling at least one event over the summer; the average number of events they recalled was 10. These respondents indicated they were home for just

[19] Six were home themselves and four indicated that another member of the household was home.

over half (59%) of the events they recalled. Notably, only 8% of participants who recalled at least one 2016 event (n=26) thought that National Grid had called too many events.

Almost all participants (95%) plan to participate in future events.[20] Over half of participants (56%) are aware that energy efficiency programs offered though National Grid, such as the DemandLink Program, are funded through a surcharge on the electric bills of Rhode Island customers. For 54% of participants this knowledge has no impact on their likelihood to participate in National Grid's energy efficiency programs, while it increases the likelihood to participate for 30% and reduces it for 6%.[21]

[20] The other 5% did not know if they would participate again.

[21] An additional 10% of respondents did not provide a valid response to this question.

5. Marketing Effectiveness Analysis

Similar to prior years, the pilot conducted a range of marketing and outreach activities during 2016. Efforts included direct mail newsletters in April and October; postcards in May, July, August, and November; email blasts in September and December; and two rounds of outbound telemarketing between May and September. Postcards and emails contained messages that were specifically tailored for DemandLink participants and non-participants, respectively. In addition, community volunteers promoted the EnergyWise Home Energy Assessment at local organizations and community events throughout Little Compton and Tiverton in conjunction with the Rhode Island Energy Challenge. The different outreach activities promoted all five key pilot program components to varying degrees.

Figure 5-1 presents the 2016 marketing timeline for the pilot.

Figure 5-1. 2016 SRP Marketing Timeline

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Newsletter				■						■		
Postcard					■		■	■			■	
Email									■			■
Telemarketing					■	■		■	■			
Community Outreach						■	■	■	■			

To assess the effectiveness of the pilot's marketing and outreach activities in 2016, we conducted a survey with pilot area residents, both participants and non-participants. The survey included questions about customer recall of marketing activities, as well as the clarity and effectiveness of common messaging used in 2016 marketing materials.

This section summarizes findings from the survey. Appendix C contains detailed survey responses.

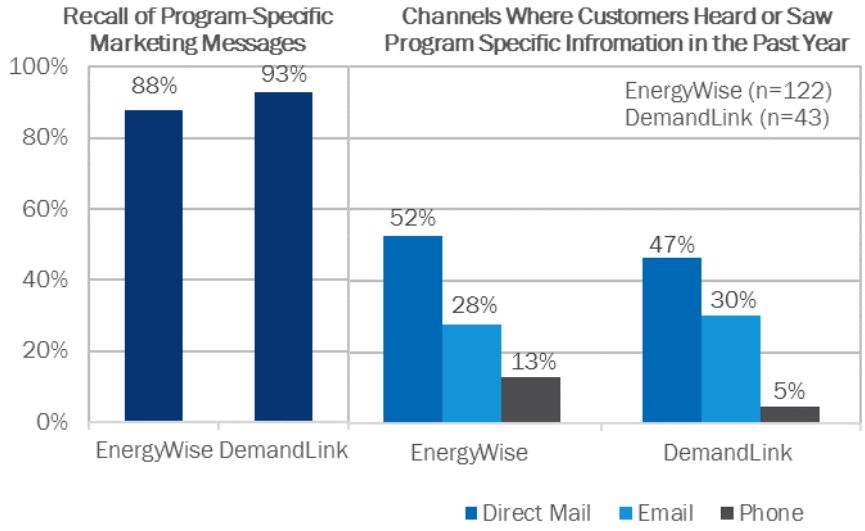
5.1 General Recall of Messaging

The first set of questions asked customers if they recalled hearing or seeing any information about each program component in the past year. These questions were only asked of customers who had heard of the program component prior to the survey. Customers who do not own their home did not receive questions about the HPWH rebate, and customers who do not plan to use window AC or to recycle a window AC unit in 2017 did not receive questions about window AC rebates.

Participant recall of messaging about components in which they had already participated (in 2016 or prior years) was very high, with 88% of EnergyWise and 93% of DemandLink participants remembering receiving program information in 2016. These participants most often recalled receiving information in the mail (52% and 47%, respectively). Program participants less frequently remembered receiving emails (28% and 30%, respectively) or phone calls (13% and 5%, respectively) from the pilot.

Figure 5-2 summarizes these findings.

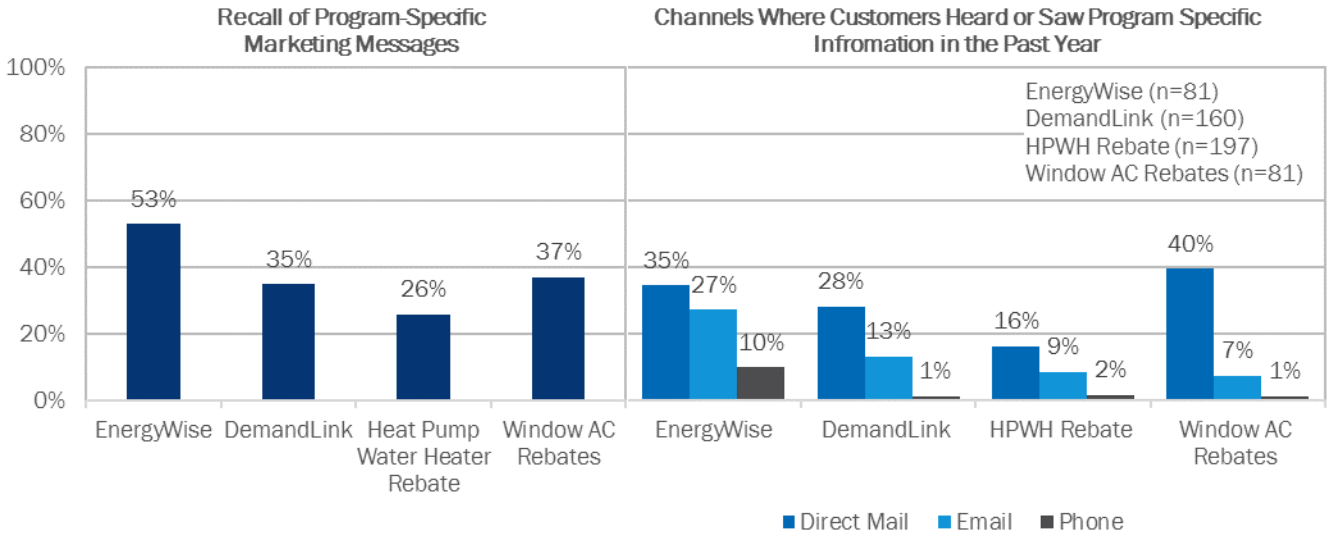
Figure 5-2. Recall of Program-Specific Marketing Messages (Participants)



Source: Marketing Effectiveness Survey

Recall of component-specific messaging among non-participants was lower compared to participants, but still high: 53% of customers who have not yet participated in the EnergyWise Program remembered receiving information about it 2016, most often in the mail. Recall rates for other program components were significantly lower (37% for window AC rebates, 35% for DemandLink, and 26% for HPWH rebates), yet still relatively high. Across all components, non-participants are most likely to remember information they received in the mail.

Figure 5-3. Recall of Program-Specific Marketing Messages (Non-Participants)



Source: Marketing Effectiveness Survey

5.2 Recall and Clarity of Specific Marketing Materials

To assess the effectiveness of messaging used by the pilot in 2016, the online survey included detailed questions about three key marketing pieces: a postcard sent in August, a newsletter sent in October, and an email sent in December. DemandLink participants and non-participants received different versions of the postcard and email, each with messaging tailored to their participation status.

The survey assessed customer recall of the specific materials as well as prior familiarity with the content and clarity of the messaging. We randomly assigned survey respondents to review and answer questions about one of the three outreach efforts. Table 5-1 describes the marketing pieces included in the survey, including the month the materials were distributed, key messaging, and the number of survey respondents who responded to the questions on the item. We provide images of the materials in Appendix C.

Table 5-1. 2016 Marketing Materials Assessed

Recipient	Distribution Month	Messaging	Count of Respondents
Newsletter			
All customers	October 2016	• Summary of participation to date among the pilot communities • In-depth summaries of the rebates available for purchasing and recycling window AC and rebates for purchasing an efficient HPWH • Overview of the DemandLink Thermostat program • Reminder to those already participating in DemandLink to connect their thermostats to their WiFi network	75
Postcard			
DemandLink Participant	August 2016	• Reminder of how DemandLink works and to connect thermostats to the WiFi network • Promotion of the rebates available for purchasing and recycling window AC, and for purchasing an efficient HPWH	10
DemandLink Non-Participant		• DemandLink as a way to stay cool and save energy in the summer • Promotion of the rebates available for purchasing and recycling window AC, and for purchasing an efficient HPWH	49
Email			
DemandLink Participant	December 2016	• Promotion of the rebates for purchasing an efficient HPWH	19
DemandLink Non-Participant		• Promotion of the rebates available to DemandLink participants for purchasing an efficient HPWH • DemandLink as a way to take control of the home's heating and cooling expense.	56

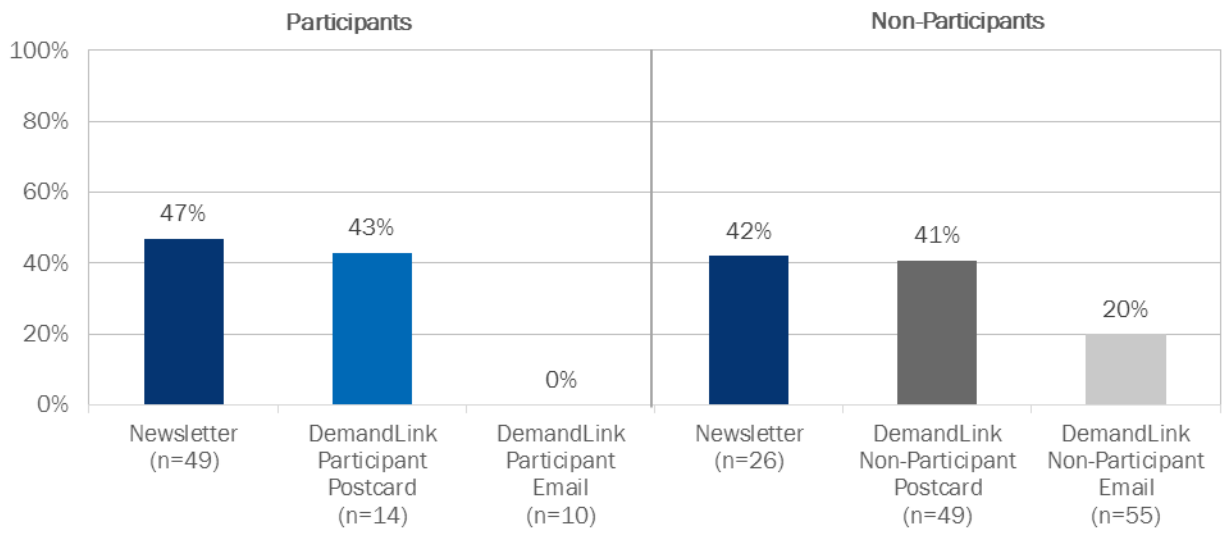
The remainder of this section summarizes responses to the questions about these materials. Because DemandLink participants and non-participants reviewed different versions of the email and postcard, we present separate results for these two groups. For the newsletter, unless otherwise noted, we present separate results for respondents who have participated in one or more of the pilot's five program components and those who have not participated in any of the five components.

Recall of Materials

Figure 5-4 shows respondent recall of the key marketing pieces. In general, the direct mail pieces were more memorable than the emails, and participants and non-participants tended to recall the materials at similar

rates. Recall rates by non-participants are relatively high, at 42% for the newsletter, 41% for the postcard, and 20% for the email.[22]

Figure 5-4. Recall of Marketing Materials



Source: Marketing Effectiveness Survey

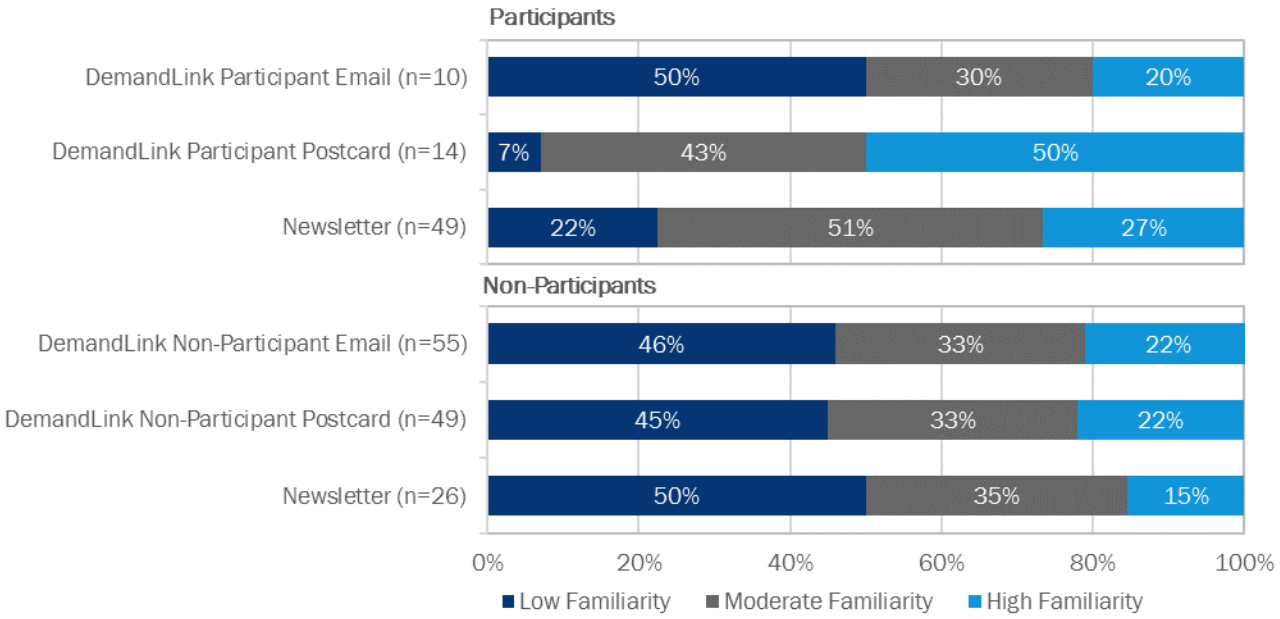
Recall of Messaging

After reviewing the materials, respondents were asked how much of the information in the images was new to them. We used this question to assess the degree to which past program messaging is remembered by customers. We categorize customers who indicated that none or very little of the information was new as having "high familiarity" while those who indicated that most or all of the information was new as having "low familiarity".

Overall, DemandLink participants have the highest level of familiarity with the content of the postcard (50% high familiarity; 43% moderate familiarity), followed by participant familiarity with the content of the newsletter (27% high familiarity; 51% moderate familiarity). Non-participant familiarity is relatively consistent across the three outreach channels and comparable to DemandLink participant familiarity with the content of the email: all have a level of high familiarity between 15% and 22% and a level of low familiarity between 45% and 50%.

[22] The IOU industry standard for email open rates is (22%). Considering a customer has to open an email to recall it, a recall rate of 20% suggest an open rate that is in line with, or exceeds, what would be expected for email outreach. (Source: Questline, 2015 Energy Utility Email Benchmarks Report available at: https://cdn.questline.com/asset/get/47a2f0f7-f0fd-4917-b7b6-2625e84ef911)

Figure 5-5. Recall of Information Provided by Marketing Material (By Participation Status)



Source: Marketing Effectiveness Survey

Clarity of Messaging

In addition to familiarity of the messages, we also tested respondents' understanding of messaging used in the marketing materials, using a five-point clarity scale where 1 means "Not at all clear" and 5 means "Very clear". The survey asked respondents to rate the clarity of messaging around the following topics:

- Why someone would want to sign up for the offerings
- How to get more information about the offerings
- What DemandLink is
- That customers have to sign up for DemandLink to be eligible for the HPWH rebate
- That National Grid wants DemandLink participants to make sure their thermostat is connected to their Wi-Fi network
- Why DemandLink participants' thermostats need to be connected to their Wi-Fi network

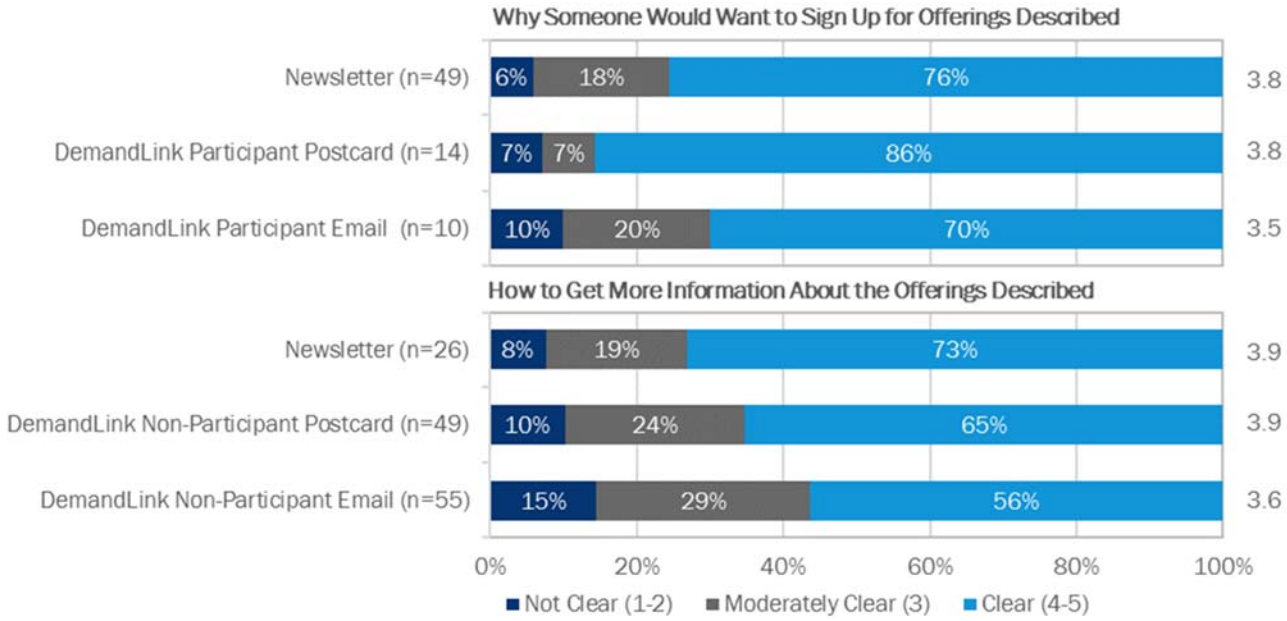
Responses to these questions are summarized below.

Benefits of Offerings and How to Get More Information

Customers reported high clarity of the messaging about the benefits of the different offerings and how to get more information (see Figure 5-6). With average clarity ratings ranging from 3.5 to 3.9, respondents found the materials similarly clear in explaining why someone would want to sign up for the offerings and how to

get more information. Clarity ratings for the email tended to be lower compared to the newsletter and postcard, although the differences are not statistically significant at 90% confidence.

Figure 5-6. Benefits of Offerings and How to Get More Information



Source: Marketing Effectiveness Survey

DemandLink Messaging for Non-Participants

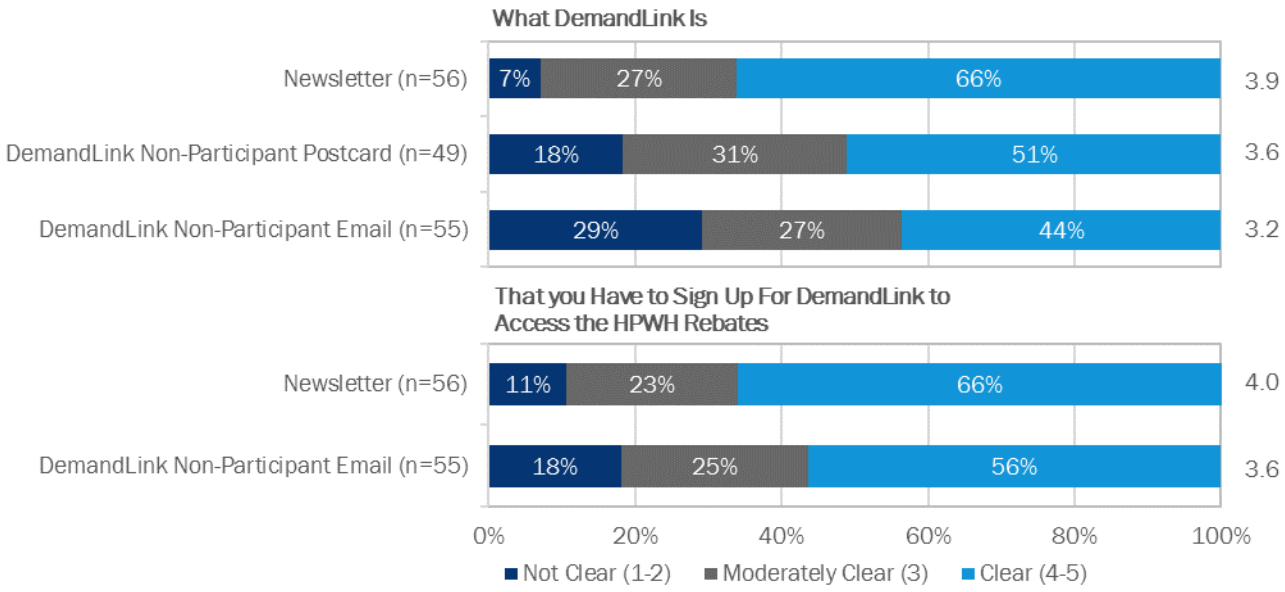
Customers who had not yet participated in the DemandLink thermostat program received targeting messaging in 2016, via a postcard and email, designed to inform them of the program and encourage participation. The newsletter, sent to both participants and non-participants, also contained these messages. We asked DemandLink non-participants to assess clarity of messaging surrounding the DemandLink offering in these three materials. Survey responses indicate that the newsletter more clearly explains what DemandLink is (66% provided a "clear" rating) than the postcard (51%) or email (44%).[23]

In addition, the newsletter and the non-participant targeted email promoted the HPWH rebates, noting that participation in the DemandLink program is a requirement for receiving this rebate. As shown in Figure 5-7, respondents found the newsletter slightly clearer in explaining the HPWH eligibility requirement (66% of respondents report it was "clear"), compared to the email (56%), although this difference is not significant at 90% confidence.

Given that participation in DemandLink is a requirement for receiving a HPWH rebate, clear messaging about what DemandLink is will be important if the pilot wishes to continue increasing its participation in the HPWH program.

[23] Only the difference between the newsletter and the email is significant at 90% confidence.

Figure 5-7. Clarity of DemandLink Messaging for Non-Participants

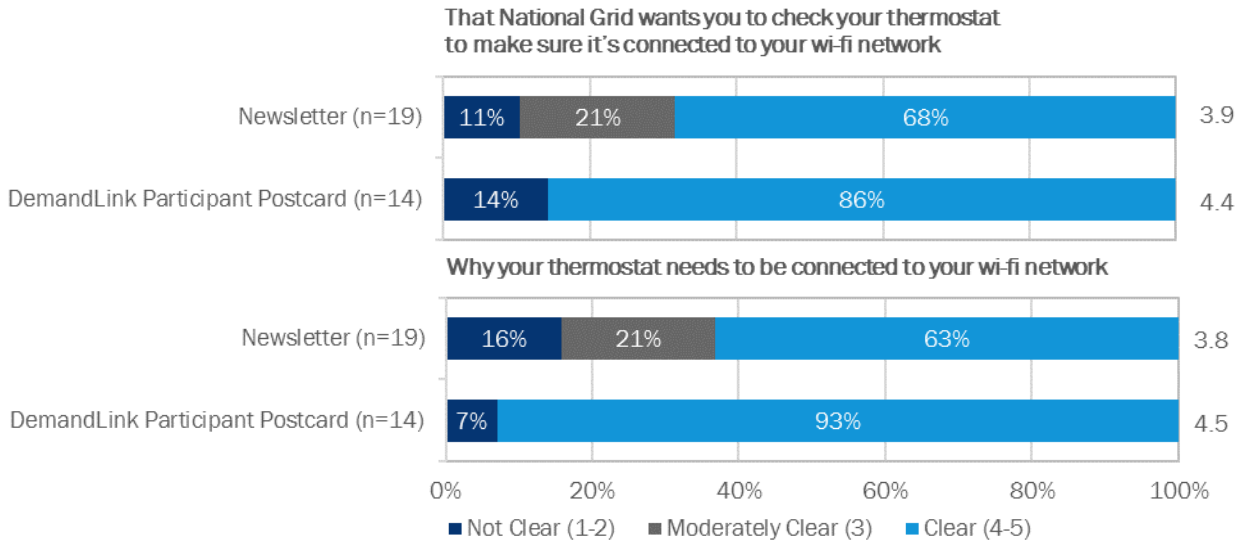


Source: Marketing Effectiveness Survey

DemandLink Messaging for Participants

Customers who had already participated in the DemandLink thermostat program also received targeting messaging in 2016, via the postcard. One of the main purposes of the postcard was encourage participants to check that their AC units were connected to their Wi-Fi – a necessary condition to be able to participate in demand response events. The newsletter also contained this message. Not surprisingly, given its focus on this topic, respondents found the post card clearer in conveying this message: 86% of DemandLink participants thought that the post card was clear in conveying that National Grid wants them to check their thermostat connectivity, and 93% thought the post card made it clear why it was important to do so. This message was slightly less clear in the newsletter, which also contained a lot of other messaging. Figure 5-8 summarizes these findings.

Figure 5-8. Clarity of DemandLink Messaging for Participants



Source: Marketing Effectiveness Survey

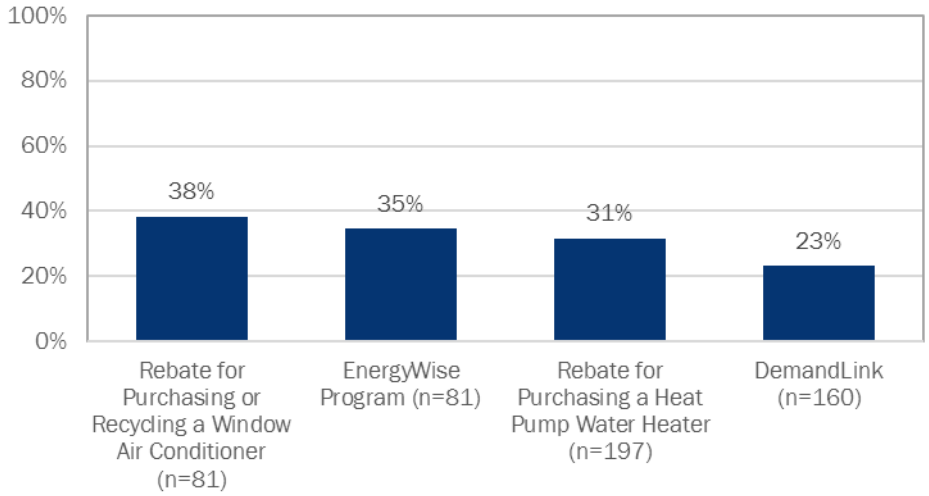
Interest in Programs after Review of Messaging

The final set of questions in the Marketing Effectiveness Survey assessed customers' likelihood to visit the pilot's website or get more information about one or more of the offerings, following their review of the materials. Overall, 48% of respondents reported being likely[24] to seek out more information.

Of non-participants eligible to participate in the various components, about one-third are interested in seeking more information about window AC rebates (38%), the EnergyWise program (35%), and the HPWH rebate (31%). Significantly fewer DemandLink non-participants are likely to seek more information about the DemandLink Program (23%).

[24] A rating of 3 or greater on a 5-point scale, where 1 means "not at all likely" and 5 means "very likely".

Figure 5-9. Interest in More Information About Program (Non-Participant in Program Component)



Source: Marketing Effectiveness Survey

Appendix A. EnergyWise Load Impact Analysis – Additional Details

For each EnergyWise measure category, we calculated load impacts as the total quantity of measures installed in the pilot area, multiplied by coincident peak kW savings:

*Peak kW Savings = Quantity * kW Reduction per Unit * Summer Diversity Factor*

To develop incremental SRP load impacts, we then multiplied total peak kW savings by the take rate developed as part of the 2015 evaluation. The following are key inputs into this analysis:

A. **Measure category:** The EnergyWise participation data included a measure category for each installation record. Peak savings are not assigned in the participation database, and therefore must be assigned based on deemed factors.
B. **Pilot Quantity:** Measure quantity comes from the program tracking data. We assigned measures to the 2016 program year based on the paid date, matching how National Grid counts savings in each year. We only included measures installed by substation customers, based on account numbers provided by National Grid.
C. **Peak kW Reduction Factors:** National Grid provided deemed load reduction values and diversity factors for each EnergyWise measure category. The factors that National Grid provided are the same load assumptions that National Grid is currently using for cost-effectiveness tests of the EnergyWise Single-Family program in Rhode Island. Since these assumptions are specific to the EnergyWise Program, they may differ from assumptions for analogous measures in the 2016 Rhode Island TRM.
D. **Take Rate:** The take rate is the percentage of measure installations that can be attributed to the SRP Pilot efforts – i.e., measure installations that would not have occurred in the absence of SRP Pilot marketing efforts. Since the 2016 evaluation did not include estimation of the take rate, we used the take rate developed as part of the 2015 evaluation. (See discussion in Section 3.2 above.)

The following table shows gross kW reduction assumptions and summer peak diversity factors for EnergyWise measures.

Table A-1. EnergyWise 2016 Load Impact Factors

Measure Category	Gross kW Reduction per unit	Summer Diversity Factor	Average Peak Summer Load Reduction (kW)
LED Bulb	0.050	0.13	0.007
CFL Bulb	0.044	0.13	0.006
Indoor Fixture	0.072	0.13	0.009
Torchiere	0.060	0.13	0.008
Outdoor fixture	1.000	0.00	0.000
Smart Strip	0.016	0.73	0.012
Refrigerator Rebate	0.095	1.00	0.095
Refrigerator Brush	0.005	1.00	0.005
Programmable Thermostat - Electric Heat	0.180	0.20	0.036
Programmable Thermostat - Non-Electric Heat	0.231	1.00	0.231
WiFi Thermostat - Electric Heat	0.060	0.20	0.012
WiFi Thermostat - Non-Electric Heat	0.231	1.00	0.231
Weatherization - Electric Heat	0.832	0.20	0.166
Weatherization - Gas Heat	0.134	0.20	0.027
Weatherization - Oil Heat	0.179	0.20	0.036
Ventilation – Other	0.000	1.00	0.000
AC Timer	0.000	1.00	0.000
Aerator - Electric Heat	0.007	1.00	0.007
Aerator - Non-Electric Heat	0.000	0.58	0.000
HPWH 50 Gallon - Electric Heat	0.370	0.58	0.215
HPWH 50 Gallon - Non-Electric Heat	0.370	0.47	0.174
DHW Pipe Wrap/Insulation - Electric Heat	0.016	1.00	0.016
DHW Pipe Wrap/Insulation - Non-Electric Heat	0.000	1.00	0.000
Low Flow Showerhead - Electric Heat	0.033	1.00	0.033
Low Flow Showerhead - Non-Electric Heat	0.000	0.58	0.000

Appendix B. DemandLink Evaluation – Additional Details

This appendix provides additional information on the DemandLink impact evaluation, including a description of the thermostat log files, a more detailed discussion of the methodology used to assess impacts from central AC demand response events, and additional analysis results for individual events.

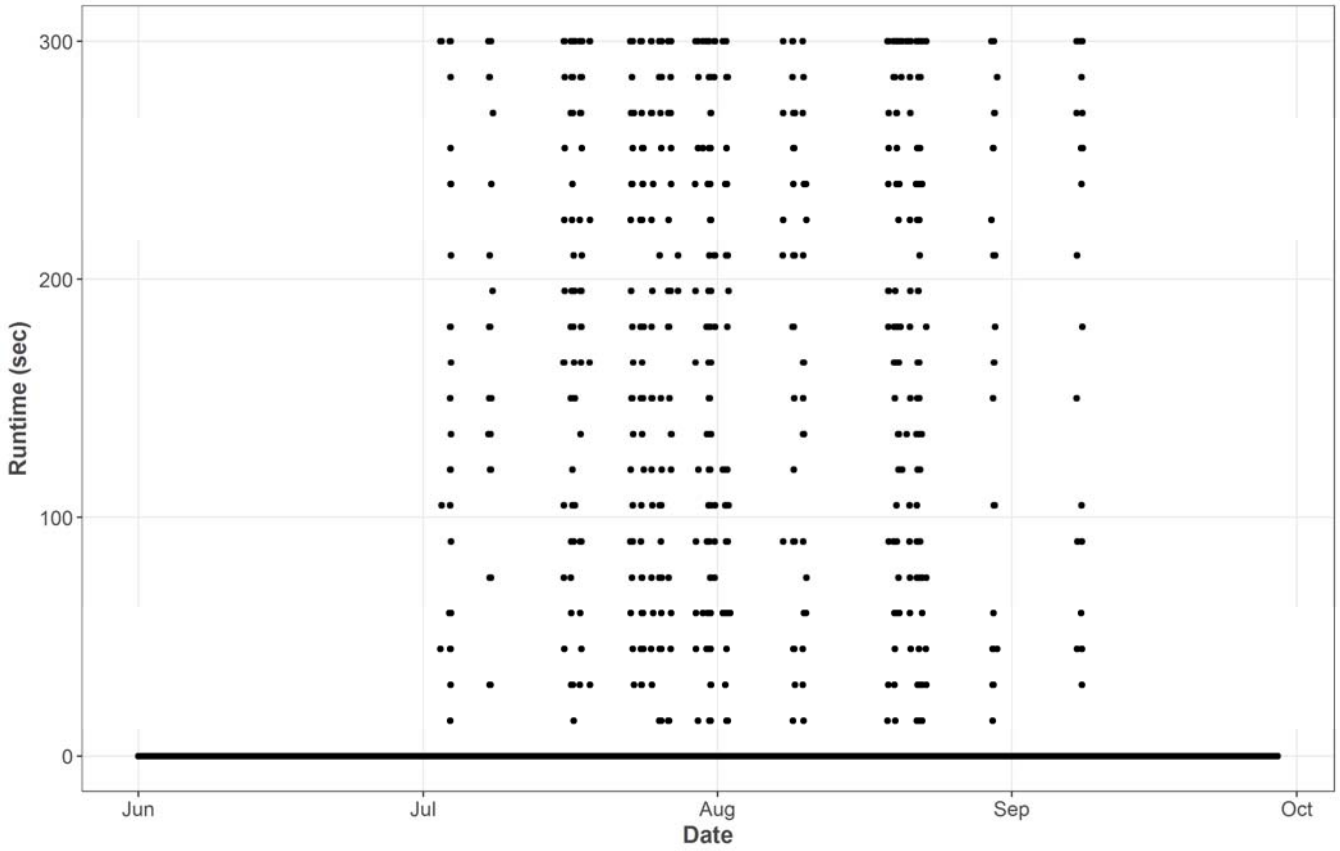
Description of Log Files

Central AC Logs

The logs for thermostats associated with central AC contain data record at five-minute intervals. During each of those intervals, the log records the run-time of the AC unit, the temperature setting, the indoor temperature, an event code, and several other variables. The central AC impact analysis uses the unit's run-time as the dependent (or primary) variable.

Figure B-1 shows peak season central AC run-time from one of the central AC thermostat logs. Each dot on the chart shows the run-time for a five-minute period. When the plotted run-time is 300 seconds (i.e., five minutes), the AC was running continuously for that period. The solid line at the bottom of the graph reflects many individual readings of zero, i.e., periods when the unit was not running. It indicates that while the unit was not running, it was online continuously. An interrupted line represents periods of disconnectivity. Based on the dots in Figure B-1 the unit was online continuously between June and October but was running only intermittently from July through early September.

Figure B-1. Example of Run-Time per 5-Minute Interval for One Central AC Unit



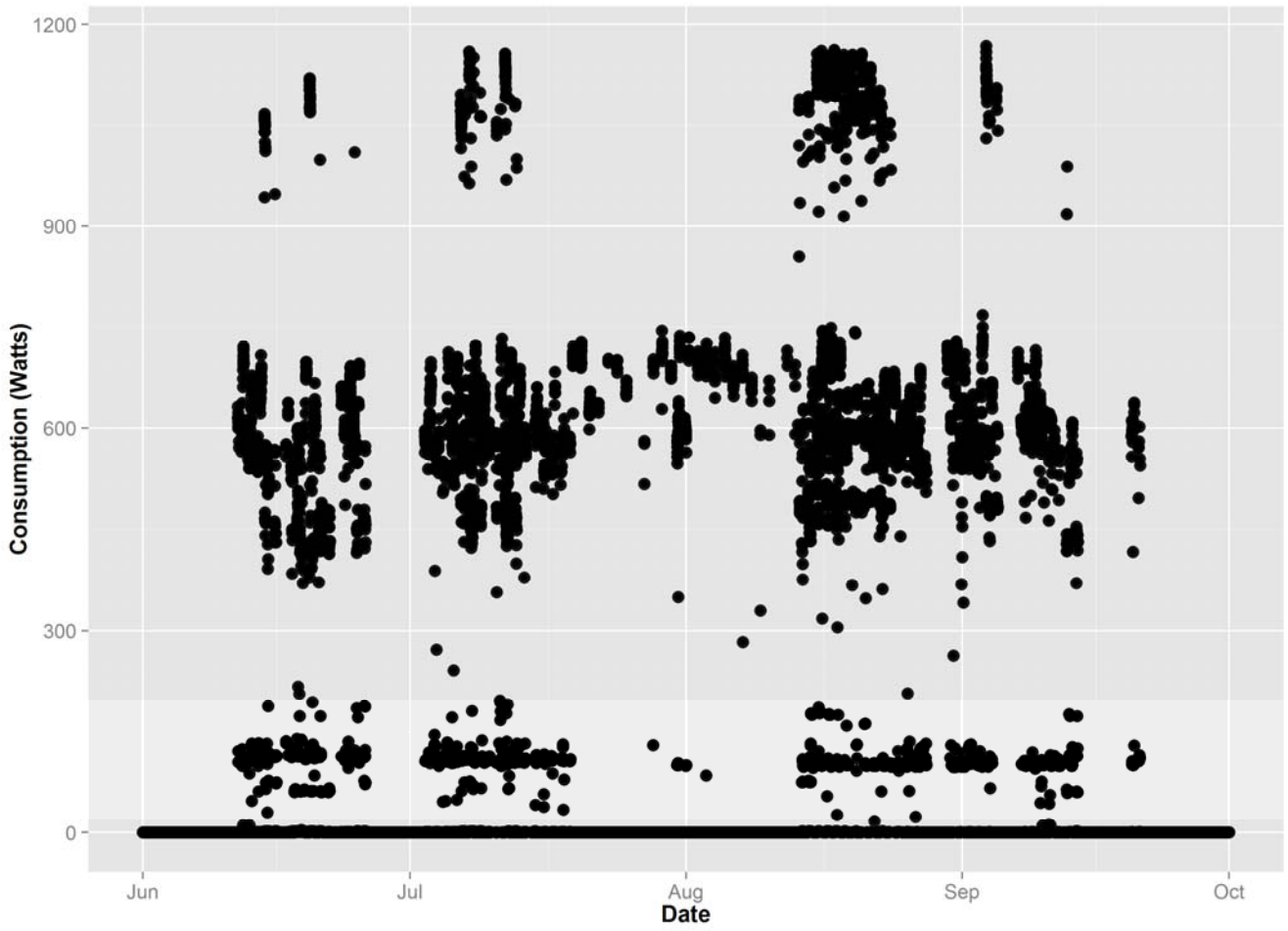
Window AC Logs

The logs for thermostats associated with window AC units contain similar types of five-minute interval data as logs for central AC thermostats. In addition, the window AC thermostat logs record the Watt consumption of up to five window AC units (each plugged into a separate plug device). The window AC impact analysis uses the total AC demand (in kW) as the dependent variable.

Figure B-2 shows an example of window AC consumption in Watts per 5-minute interval for a thermostats that successfully controlled a window AC during the peak season. The log shows data from mid-June until the end of the season.[25]

[25] Similar to central AC thermostats, there are gaps in the data, although most are too small to be visible in the figure.

Figure B-2. Example of Watt Usage per 5-Minute Interval for One Window AC Unit



Impact Methodology for Central AC Demand Response Impact Analysis

Opinion Dynamics used regression modeling combined with day matching to estimate the demand response runtime reduction for central AC participants. The load impacts for central AC events are then calculated by multiplying the runtime reduction by the mean full load demand, to arrive at the demand reduction attributable to the event. We describe our regression modeling and day matching methods below.

Model Specification

We used a linear fixed-effects regression (LFER) modeling approach for the demand response impact analysis. This model accounts for the time-invariant, household-level factors affecting energy use without measuring those factors and entering them explicitly in the models. These factors are contained in a household-specific intercept, i.e., the constant term in the regression equation.

We selected the regression model specification to predict referential load during event days to address specific event day characteristics. The model incorporates weather variables with weather as the major predictor of energy consumption. Cooling degree hours (CDH) with base 65 is included in the model as the primary weather variable. The model also includes the hour of the day, as time of day is highly predictive of usage. Terms for month, day of week, morning load, and month by hour further correct for differences between the event day and the non-event days used as comparison days for the model.

As is standard practice for demand response impact analysis, we tested many models. We selected the final models based on fit with actual usage, especially during the hours leading up to the event. We judged the ultimately selected model fit primarily on replication of actual usage during non-event hours, especially the hours before the event, so there is a high level of confidence in the reference points during event hours.

We fit separate regressions for each central AC event, using the same model specification for each individual event. We used a slightly different model specification for the overall estimate in order to better account for the complexity of including weekday and weekend events in a single model. The two linear fixed-effects regression (LFER) model specifications are as follows:

Equation B-1. Individual Event Regression Model

$$kw_{it} = \alpha_o + \alpha_i + \beta_{event} \cdot Event + \sum_{h=1}^{23} \beta_{hour\ h} \cdot Hour_h + \sum_{h=1}^{23} \beta_{event\ hour\ h} \cdot Event \cdot Hour_h +$$

$$\beta_{CDH} \cdot CDH_t + \beta_{dewpoint} \cdot Dew\ Point_t + \beta_{mornload} \cdot MornLoad_i + \sum_{h=1}^{23} \beta_{mornload\ hour\ h} \cdot Hour_h \cdot MornLoad_i$$

$$+ \beta_{nightload} \cdot NightLoad_i + \sum_{h=1}^{23} \beta_{nightload\ hour\ h} \cdot Hour_h \cdot NightLoad_i + \varepsilon_{it}$$

Where:

α_o = Overall intercept

α_i = Participant specific intercept

ε_{it} = Error term

Event = Indicator variable for event day

Hour = Set of 23 indicator variables for the hours of the day

Month = Set of 3 indicator variables for the months of the program (June-Sept)

CDH = Base 65 cooling degree hours

Dew Point = Dew point

MornLoad = The mean load for participant i for the hours of midnight through noon for the day

NightLoad = The mean load temperature for participant i for the hours of 10 p.m. to midnight for the day

Equation B-2. Overall Regression Model

$$kw_{it} = \alpha_o + \alpha_i + \beta_{event} \cdot Event + \sum_{h=1}^{23} \beta_{hour\ h} \cdot Hour_h + \sum_{h=1}^{23} \beta_{event\ hour\ h} \cdot Event \cdot Hour_h +$$

$$\beta_{CDH} \cdot CDH_t + \beta_{dewpoint} \cdot Dew\ Point_t + \beta_{mornload} \cdot MornLoad_i + \sum_{h=1}^{23} \beta_{mornload\ hour\ h} \cdot Hour_h \cdot MornLoad_i$$

$$+ \beta_{nightload} \cdot NightLoad_i + \sum_{h=1}^{23} \beta_{nightload\ hour\ h} \cdot Hour_h \cdot NightLoad_i$$

$$+ \sum_{w=1}^{6} \beta_{weekday\ w} \cdot Day\ of\ Week + \sum_{w=1}^{6} \beta_{event\ weekday\ w} \cdot Event\ + \varepsilon_{it}$$

Where:

α_o = Overall intercept

α_i = Participant specific intercept

ε_{it} = Error term

Event = Indicator variable for event day

Hour = Set of 23 indicator variables for the hours of the day

Month = Set of 3 indicator variables for the months of the program (June-Sept)

CDH = Base 65 cooling degree hours

Dew Point = Dew point

MornLoad = The mean load for participant i for the hours of midnight through noon for the day

NightLoad = The mean load temperature for participant i for the hours of 10 p.m. to midnight for the day

Day = Set of 6 indicator variables for the day of the week (Sunday – Saturday)

Day by event = The interaction of day of the week and event day

In addition to the model selected, we tested other variables and interactions for possible inclusion in the model specification. These included:

- CDH^2 – Cooling degree hours squared
- HDH – Heating degree hours
- Month – Month of the peak season, May through September
- Month by Hour – The interaction of month and hour of the day (adjusts for differences in average hourly load across months)
- Month by HDH – The interaction of month and HDH (adjusts for differences in average weather response across months)

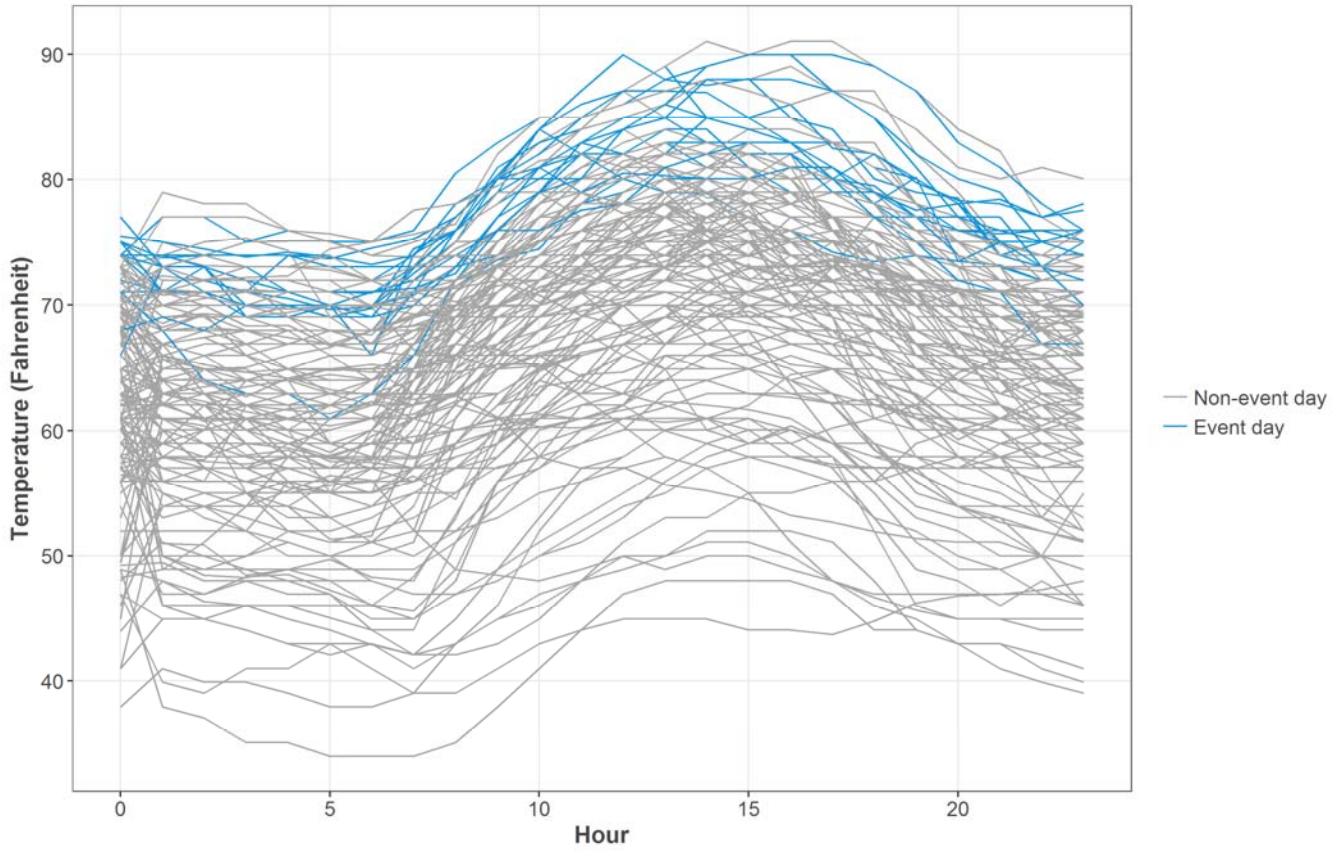
- Day by Hour – The interaction of day of week and hour of the day (adjusts for differences in average hourly load across days of the week)
- Event by CDH – The interaction of event and CDH (adjusts for different hourly load on event days based on weather)

These terms do not appear in the final model specification, as the variables and interactions already in the model are effective at correcting for differences in the actual usage and the modeled usage for non-event hours that serve as comparison. It is very important that the final model correctly replicate load during non-event hours, so the counterfactual baseline usage during the event is reliable. It is also important to remove terms and interactions that do not improve the actual and baseline model fit, as they will unnecessarily increase variance in the estimates.

Day Matching

Not all days are included in the data used in the regression model. Including cool days, when air conditioning is not used, does not add useful information for modeling what happens on the hottest days, when events are called. Figure B-3 shows the hourly temperature on event days (blue) and non-event days (gray) for all cooling season days.

Figure B-3. Event Day and Non-event Day Temperature Profiles

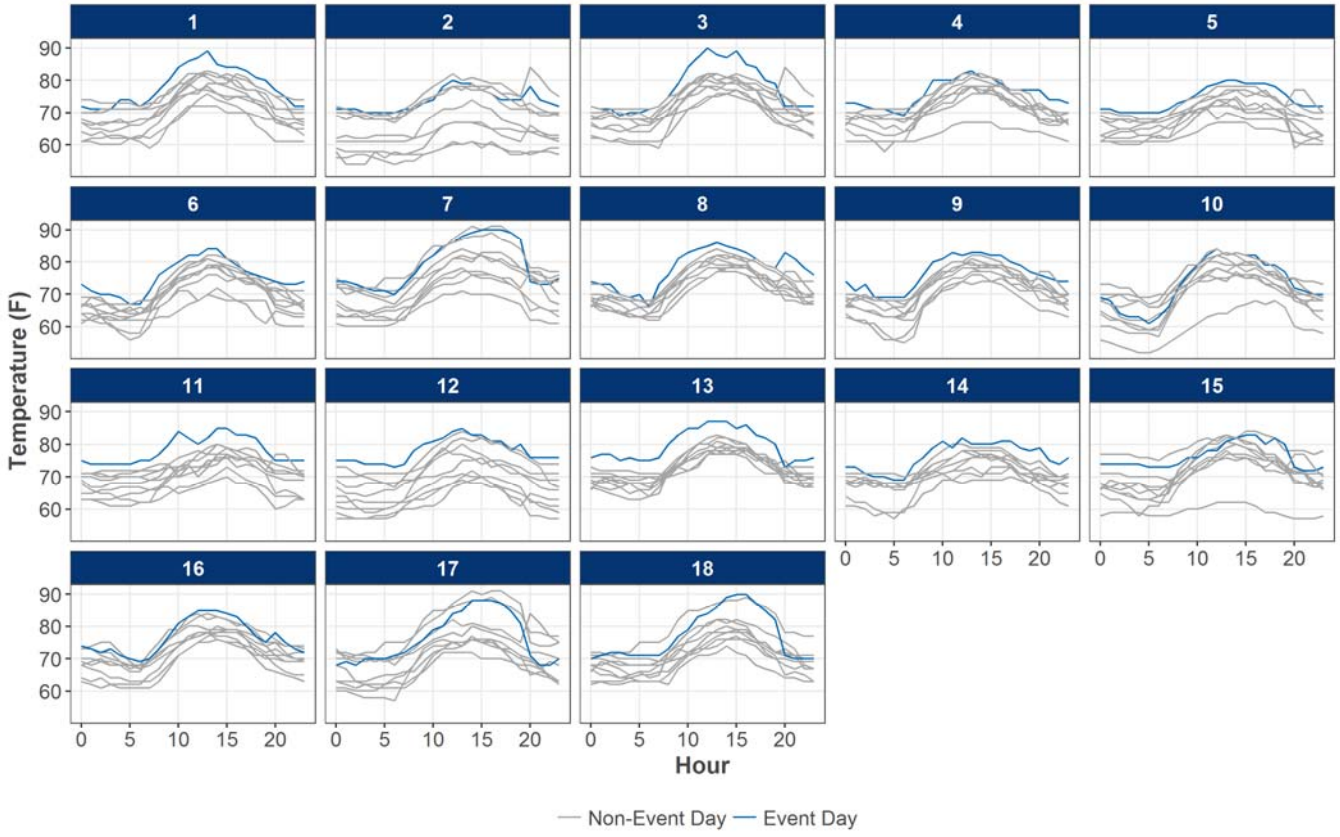


We tested several methods of day matching to find the best way of selecting comparison days that cover the range of temperatures experienced on event days. In past years, Mahalanobis distance matching – which

minimizes the difference between the event and non-event day temperatures at each hour, corrected for the measured variation in temperature at that hour and the correlation of the temperature between hours – has performed best. However, as Figure B-4 shows, Mahalanobis distance matching sometimes did not select any days that were as hot or hotter than the event day (e.g., Events 1, 3, 11, and 13). We therefore used an alternative matching strategy based on minimizing root mean squared error (RMSE) between event day and non-event day temperatures between noon and 8 p.m., and including three particularly warm days (July 23, August 14, and August 15) in all models. For most days, we included the top five matches based on RMSE, for a total of eight matches per event. For Events 11, 12, 14, and 17, we used the top 10 matches based on RMSE because the models seemed to be producing biased estimates when only the top five matches were included.[26]

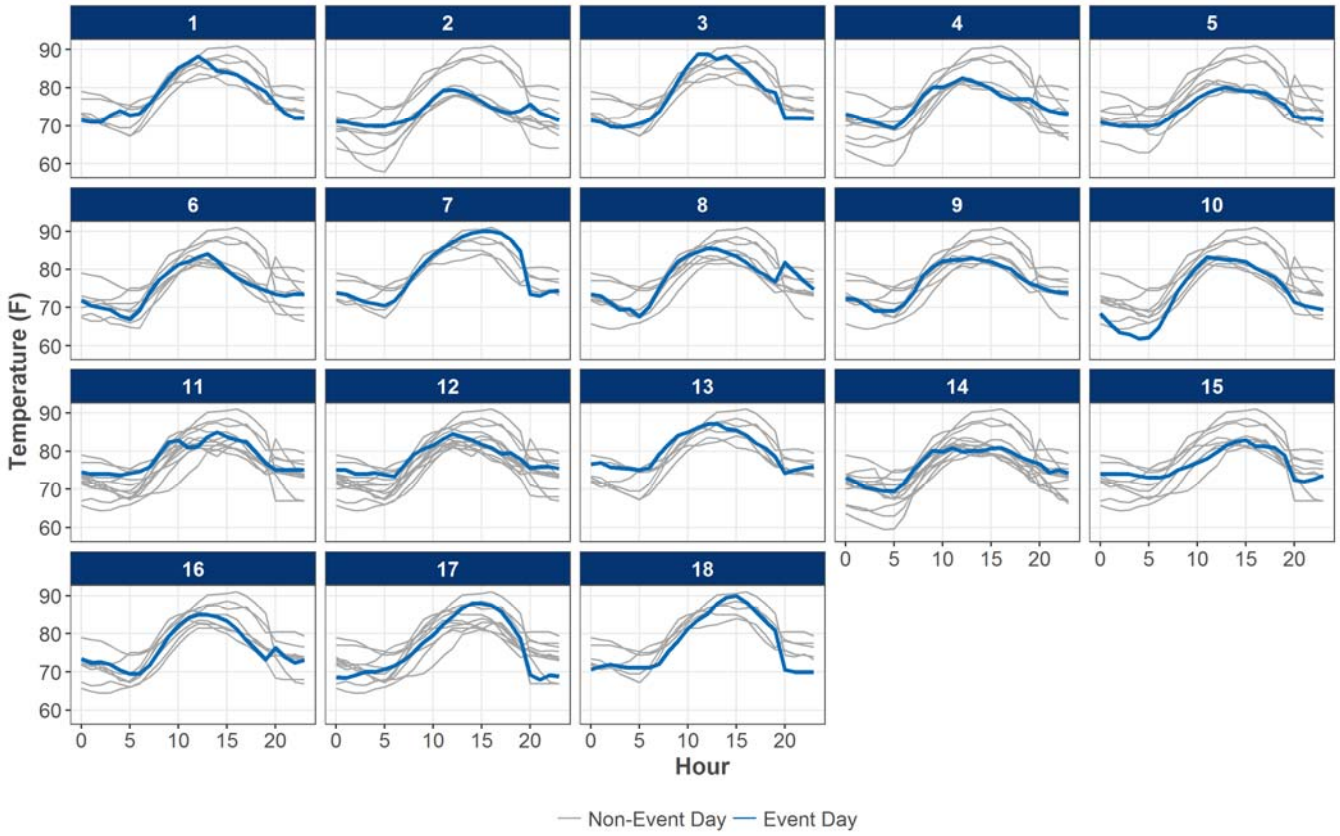
Figure B-5 shows the final set of matches used for each event.

Figure B-4. Event Day and Matched Day Temperature Profiles Based on Mahalanobis Distance Matching



[26] We determined this based on how well the models predicted runtime on non-event days not included in the original model.

Figure B-5. Event Day and Matched Day Temperature Profiles Based on Custom Matches

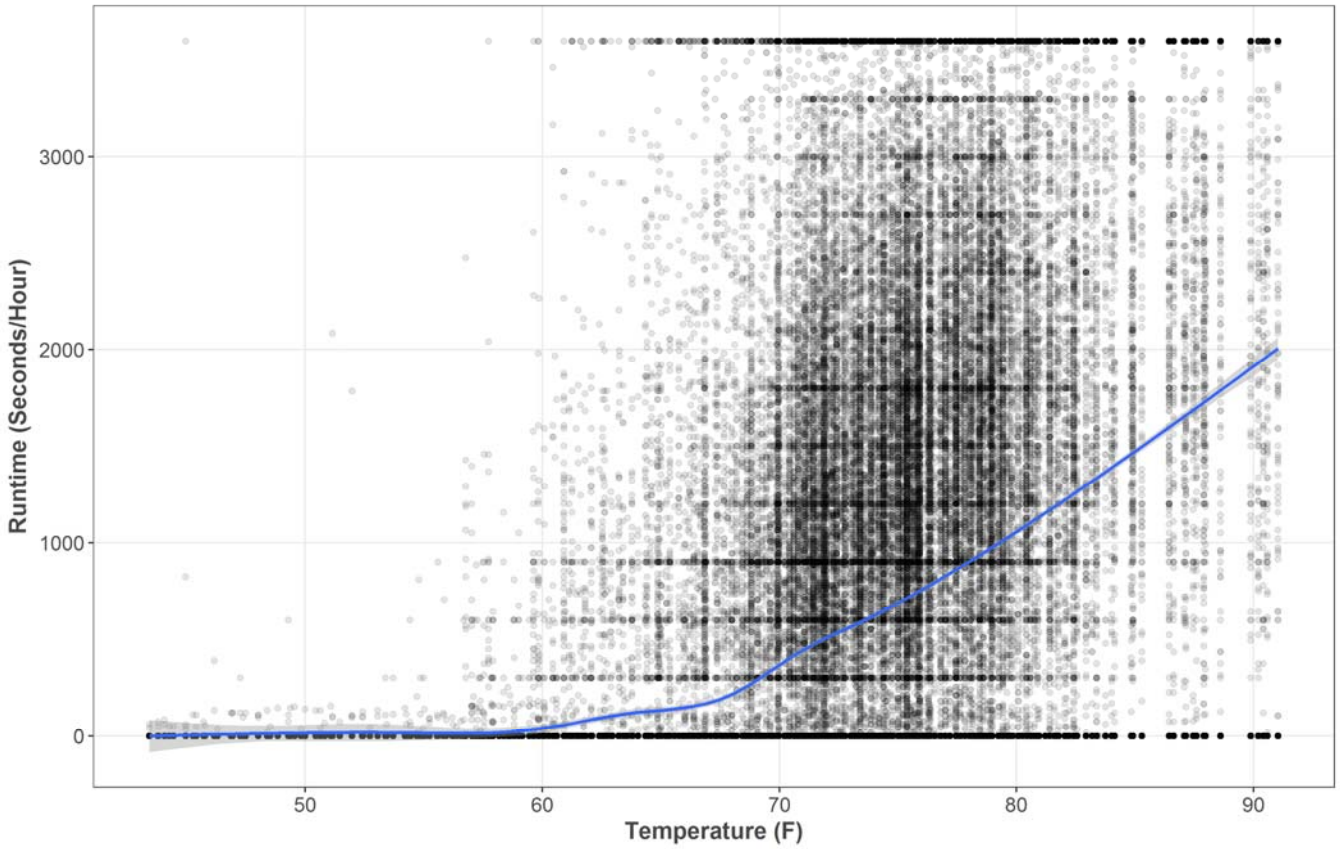


Weather Data

Opinion Dynamics gathered weather data from the National Oceanic and Atmospheric Administration's National Climactic Data Center, which houses the Integrated Surface Database of hourly weather measurements from thousands of locations across the country. We used participant addresses to geocode the locations of all participants and found that the weather station at the Newport State Airport was the closest to all pilot participants. We downloaded the hourly weather data from that station for 2016 and merged it with the thermostat logs. We then calculated cooling degree hours with an outdoor base temperature of 65 degrees for use in the model. We chose 65 degrees as the base temperature because 65 degrees is approximately the point at which participants start using their central AC units during summer afternoons.

Figure B-6 shows the average runtime versus temperature for peak season afternoons between noon and 8 p.m. Based on the modeled line, either 60 or 65 degrees could serve as a base for cooling degree hours. Consistent with our analyses of prior program years, we chose 65 degrees, which is a standard temperature for this type of analysis.

Figure B-6. Mean Central AC Runtime versus Temperature for Peak Season Afternoons



Individual Event Results – Central AC

The figures in this section show the runtime percentage along with the baseline used to calculate demand impacts for each of the 18 demand response events called in 2016. All 2016 events began at 3 p.m. and ended at 7 p.m.

Figure B-7. Central AC Event 1 (Wednesday, July 6, 2016)

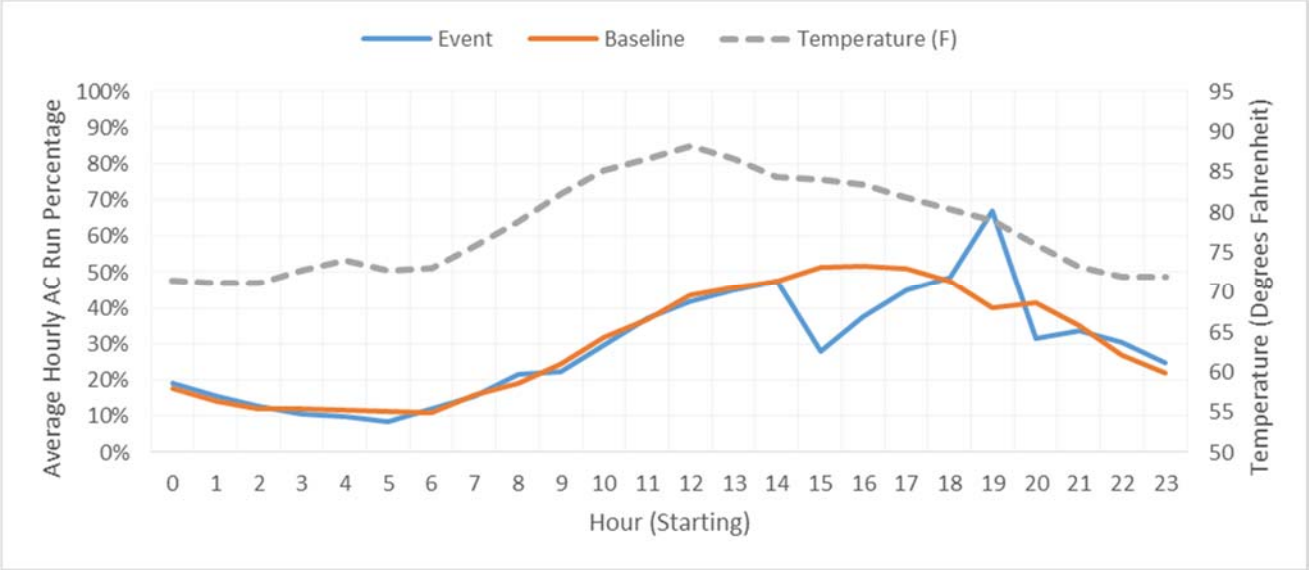


Figure B-8. Central AC Event 2 (Thursday, July 7, 2016)

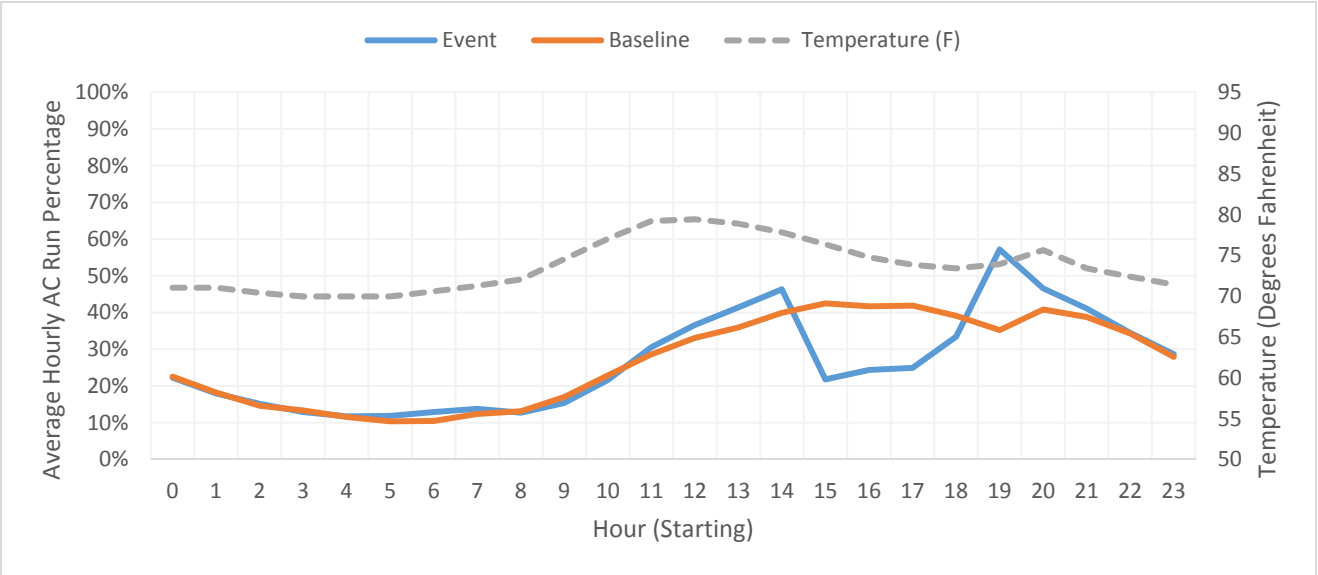


Figure B-9. Central AC Event 3 (Friday, July 15, 2016)

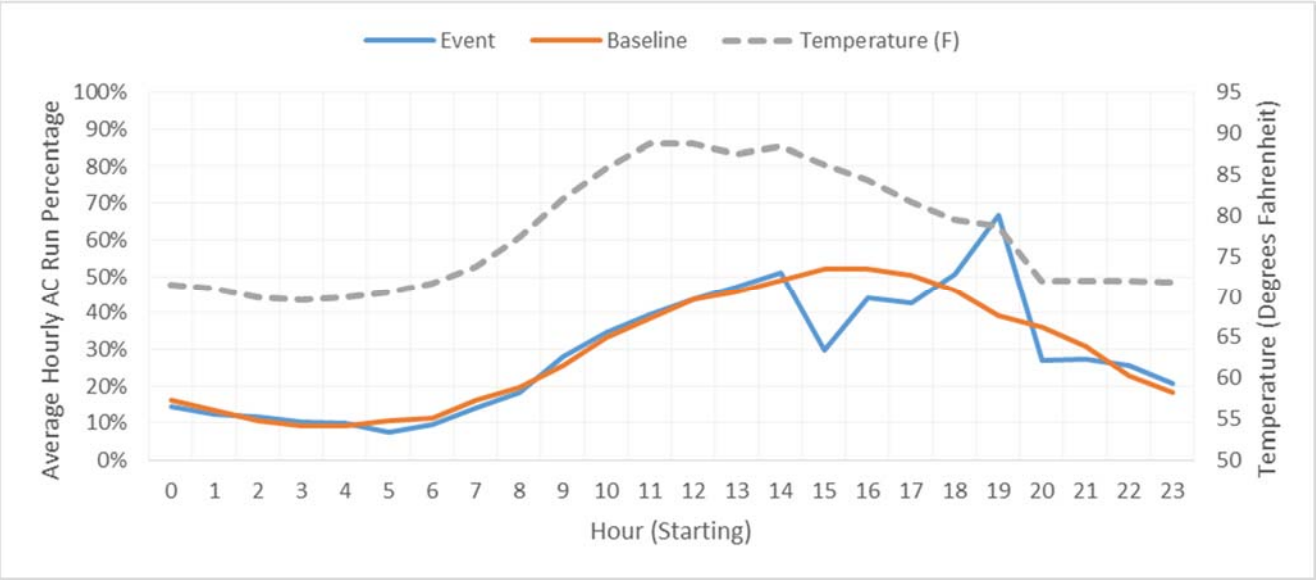


Figure B-10. Central AC Event 4 (Monday, July 18, 2016)

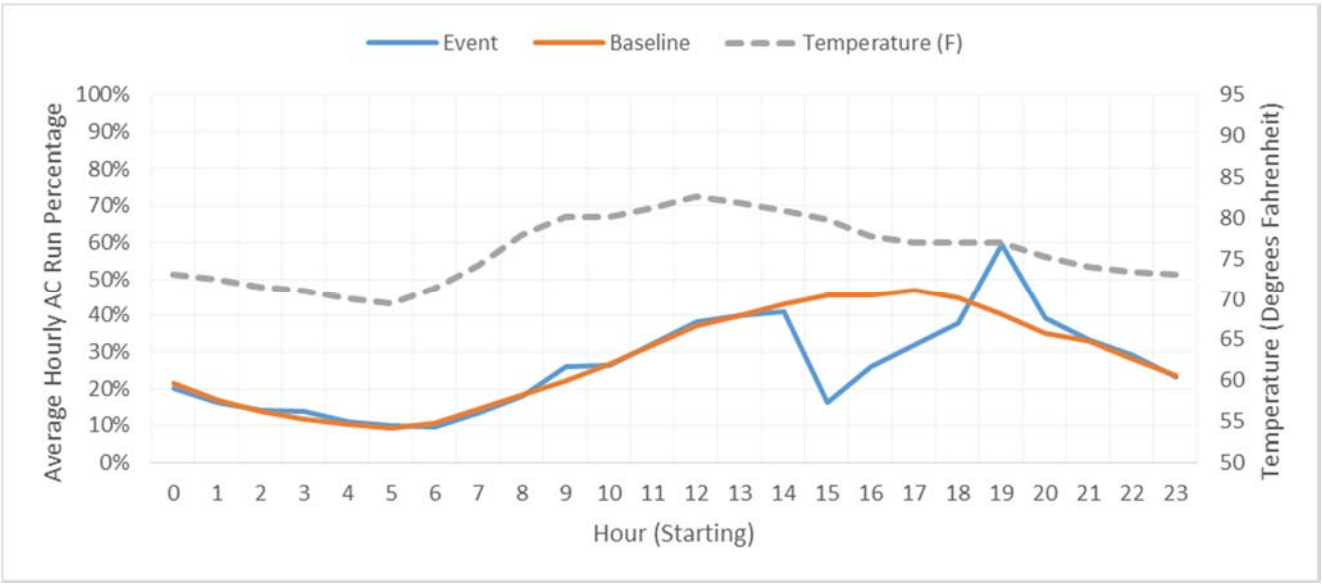


Figure B-11. Central AC Event 5 (Friday, July 22, 2016)

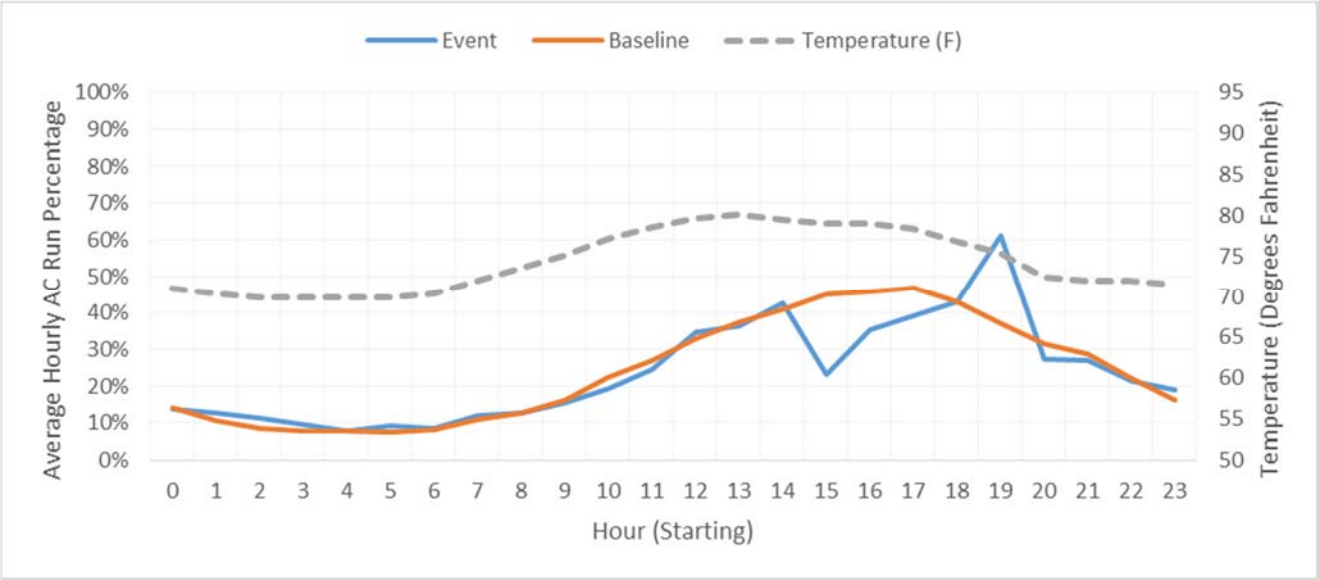


Figure B-12. Central AC Event 6 (Monday, July 25, 2016)

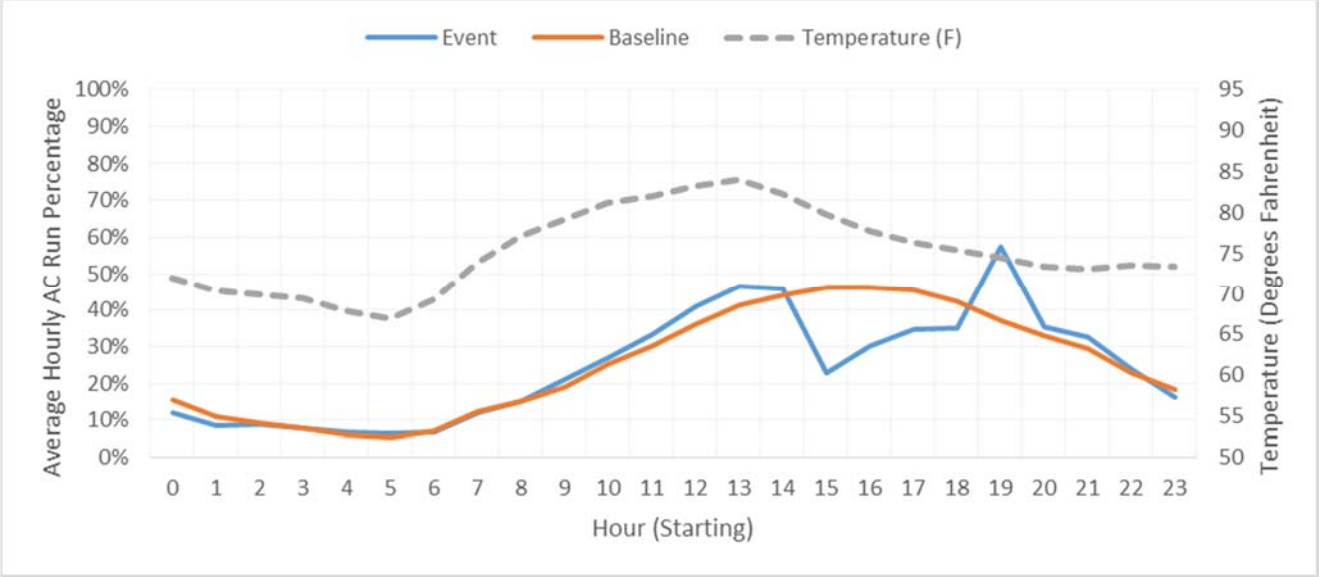


Figure B-13. Central AC Event 7 (Tuesday, July 26, 2016)

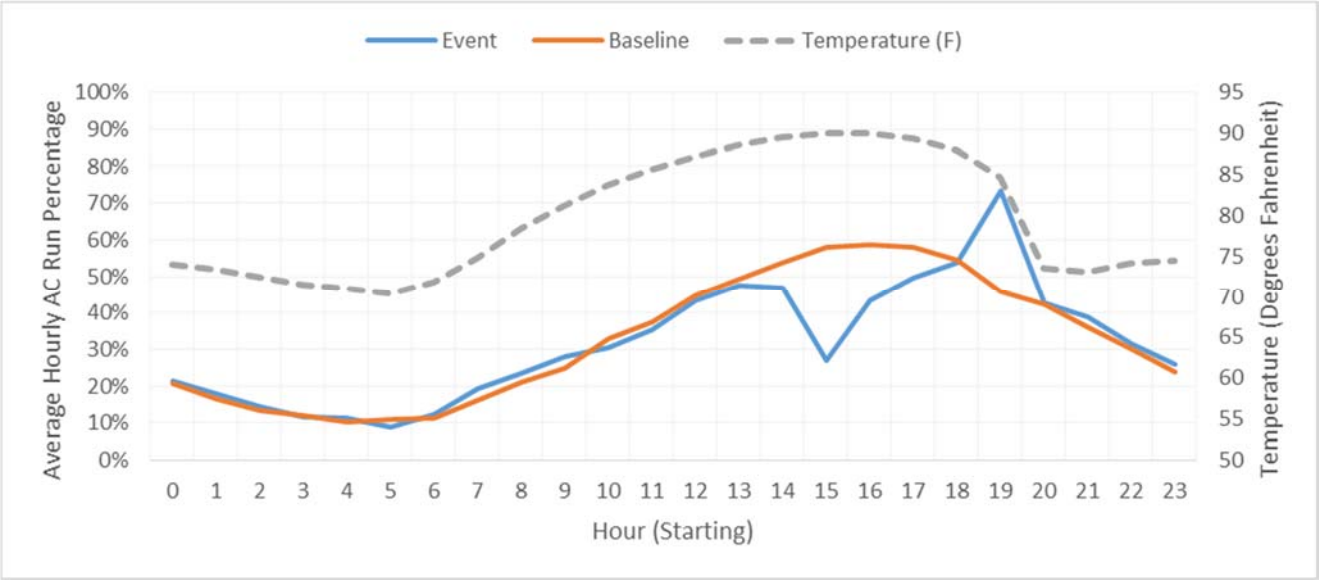


Figure B-14. Central AC Event 8 (Wednesday, July 27, 2016)

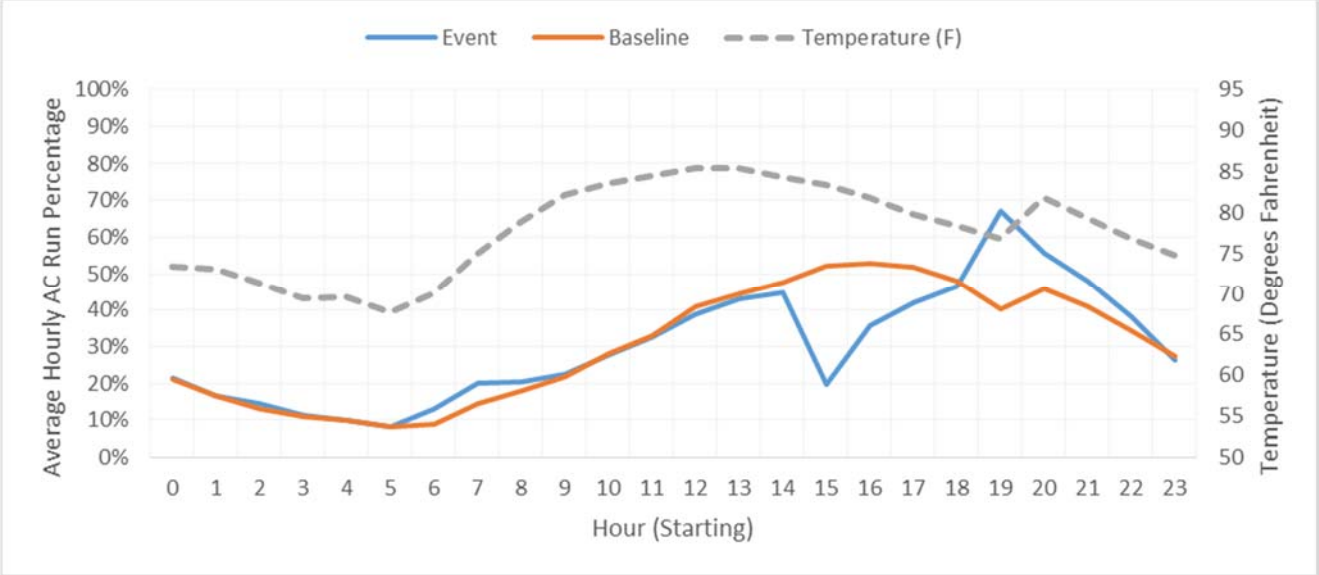


Figure B-15. Central AC Event 9 (Thursday, July 28, 2016)

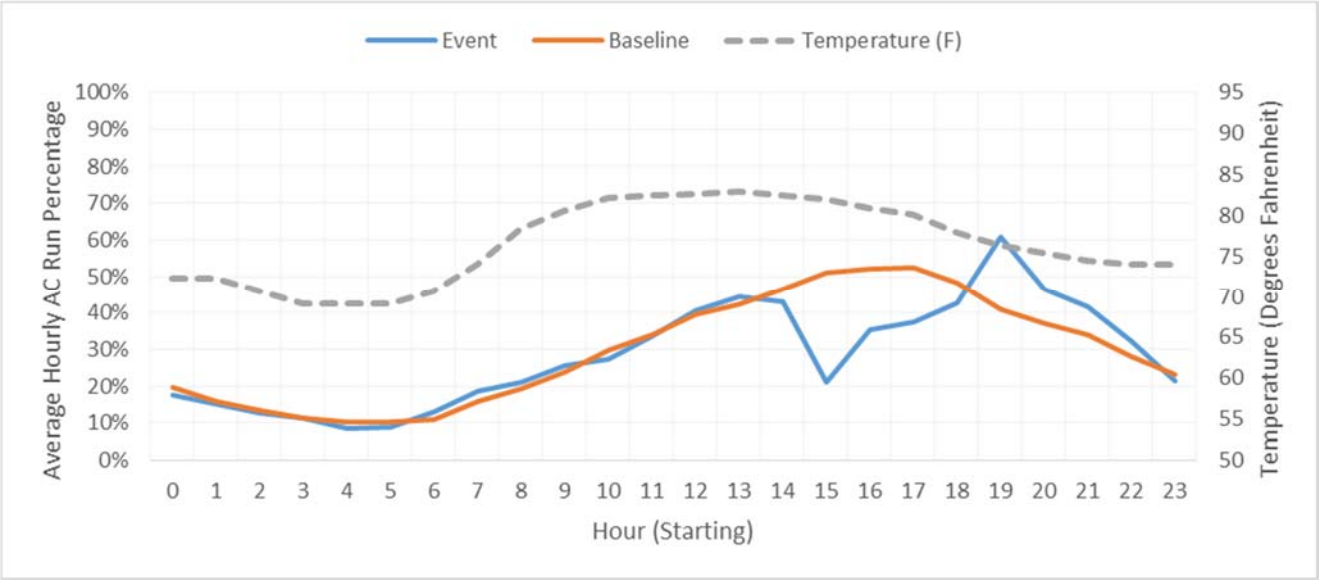


Figure B-16. Central AC Event 10 (Tuesday, August 9, 2016)

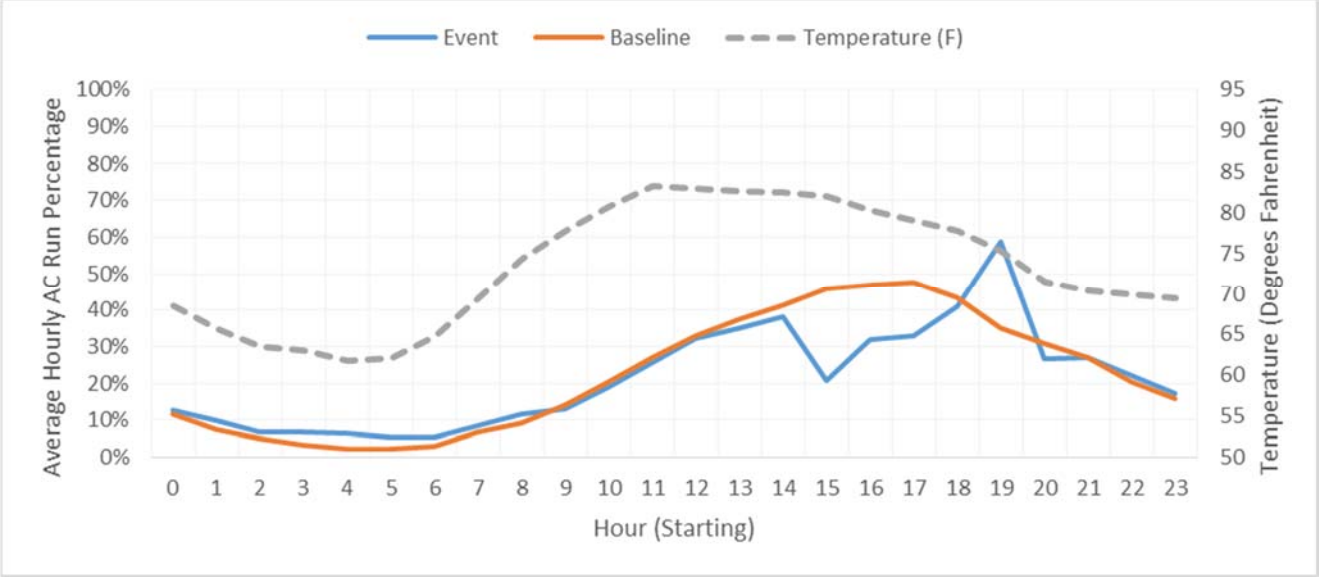


Figure B-17. Central AC Event 11 (Thursday, August 11, 2016)

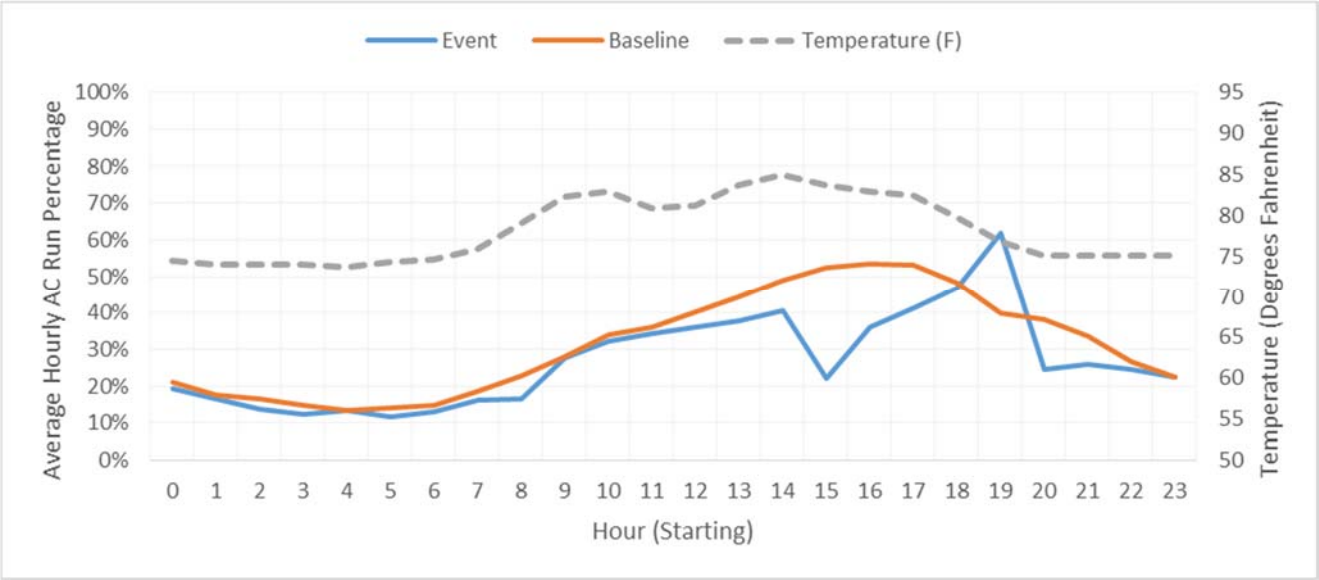


Figure B-18. Central AC Event 12 (Friday, August 12, 2016)

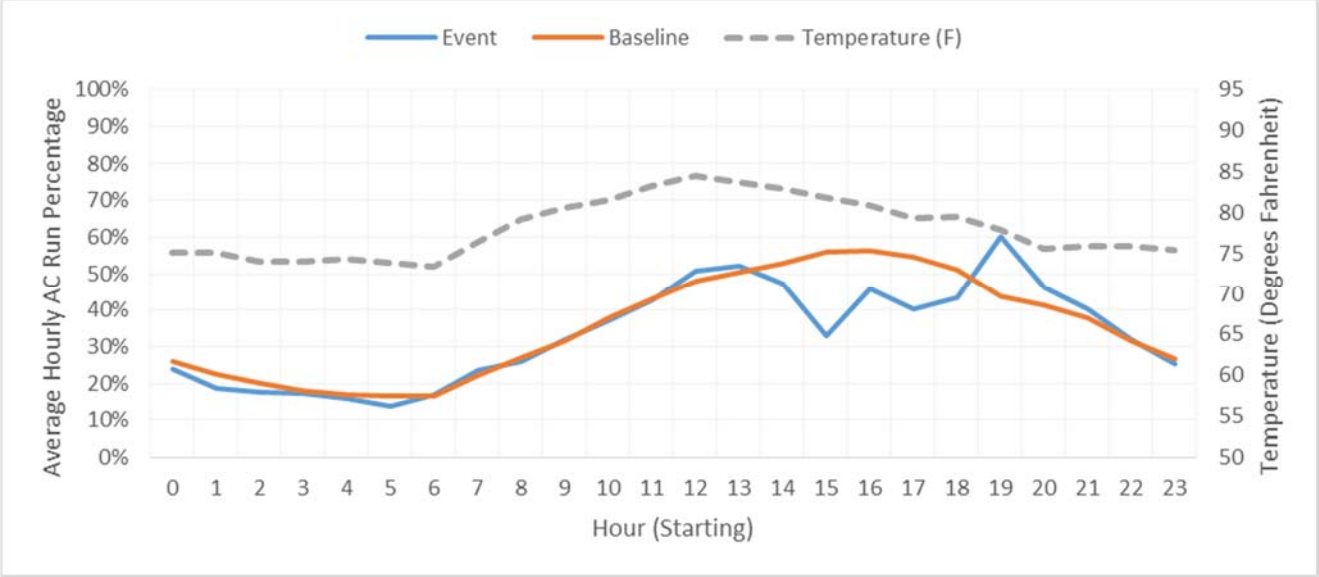


Figure B-19. Central AC Event 13 (Saturday, August 13, 2016)

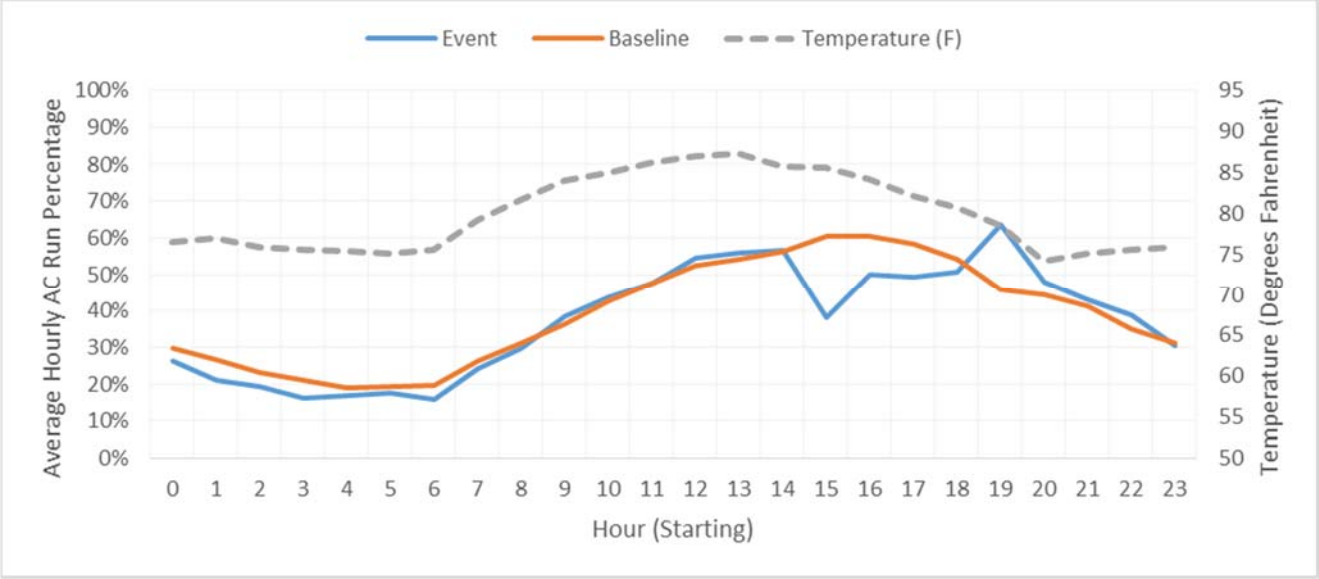


Figure B-20. Central AC Event 14 (Tuesday, August 16, 2016)

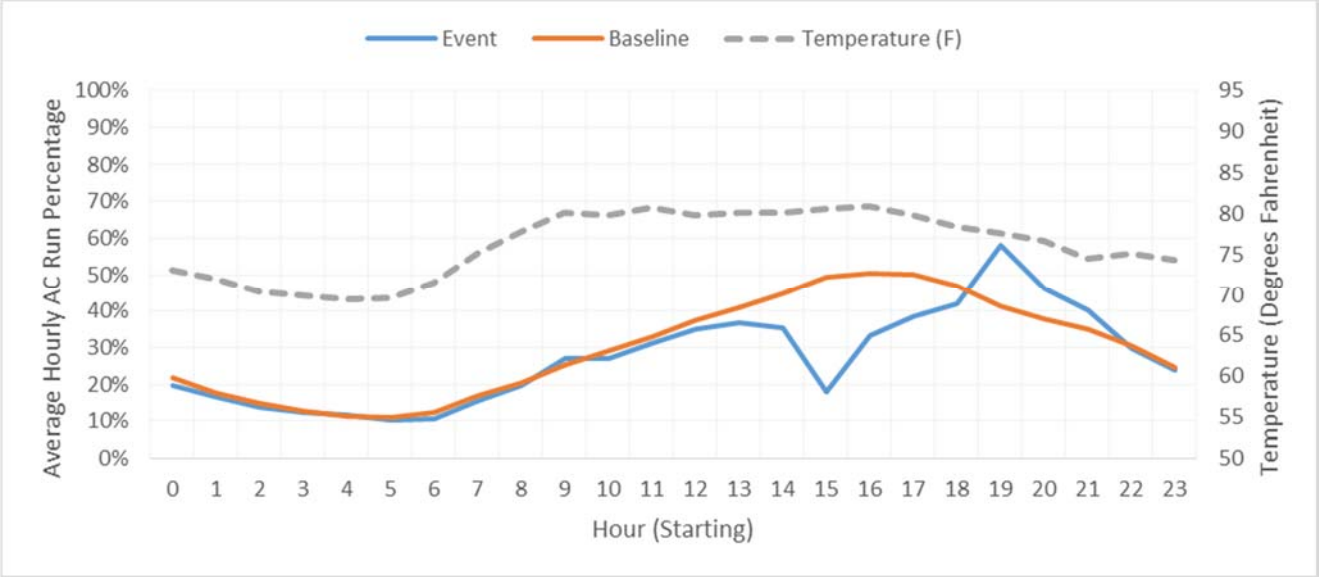


Figure B-21. Central AC Event 15 (Friday, August 26, 2016)

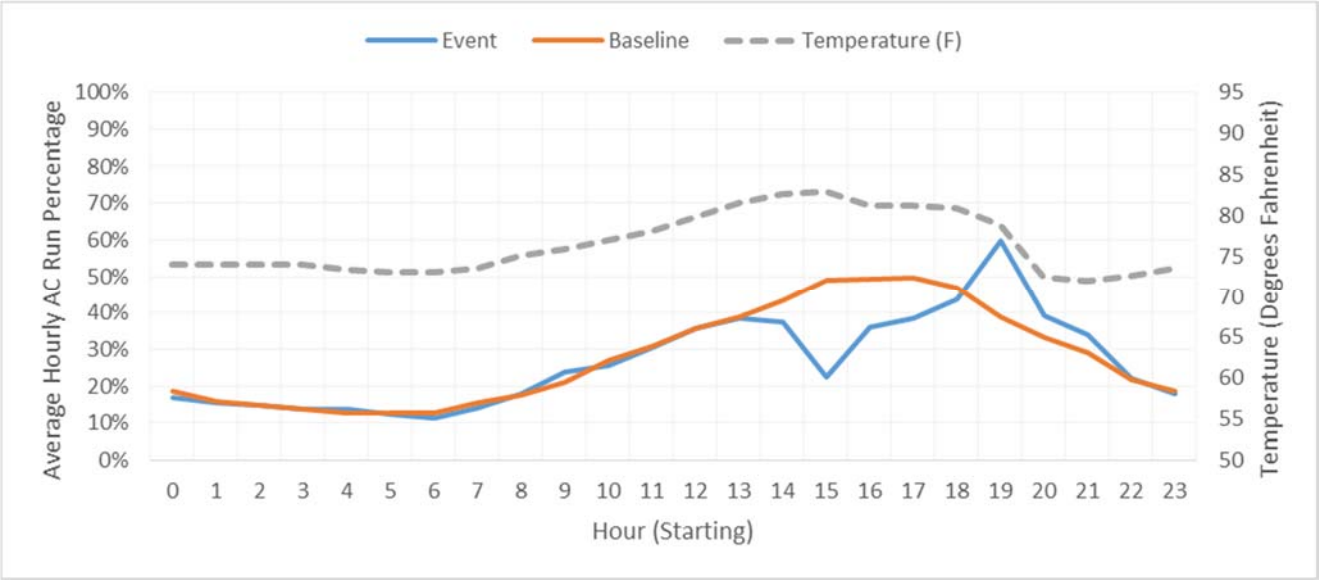


Figure B-22. Central AC Event 16 (Saturday, August 27, 2016)

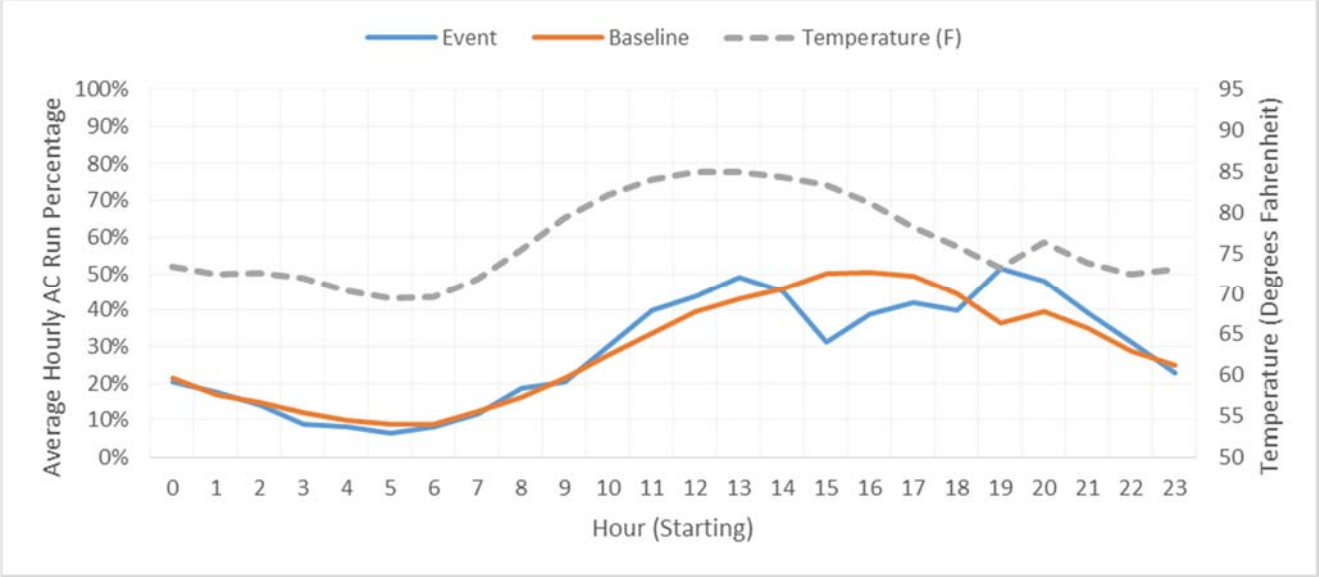


Figure B-23. Central AC Event 17 (Monday, August 29, 2016)

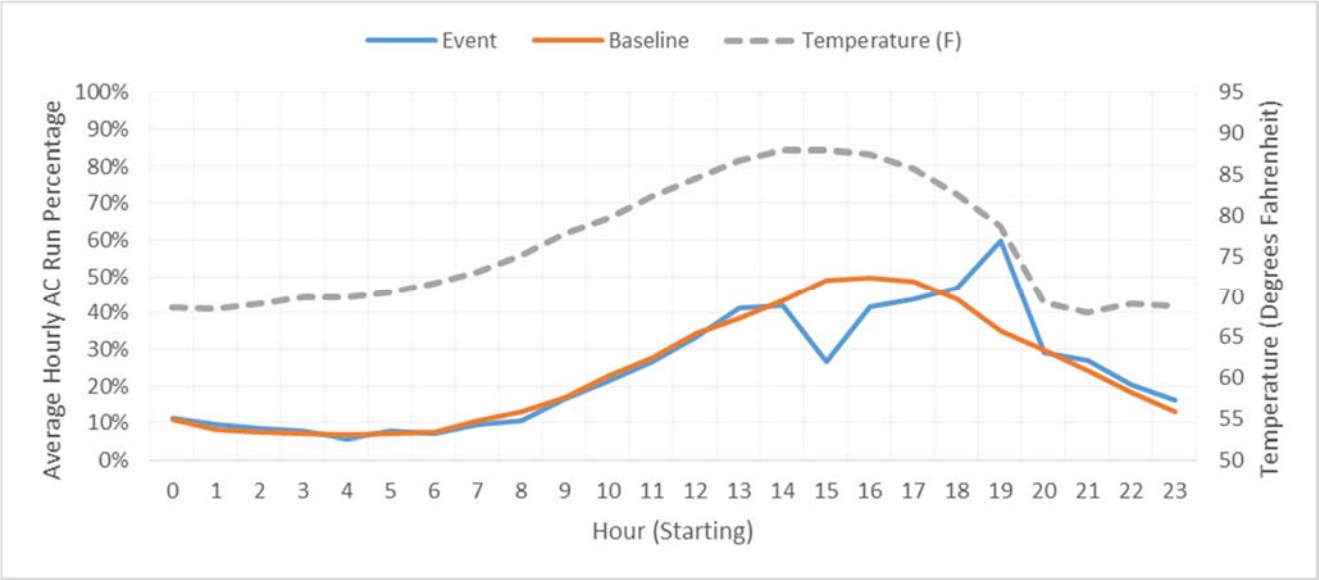
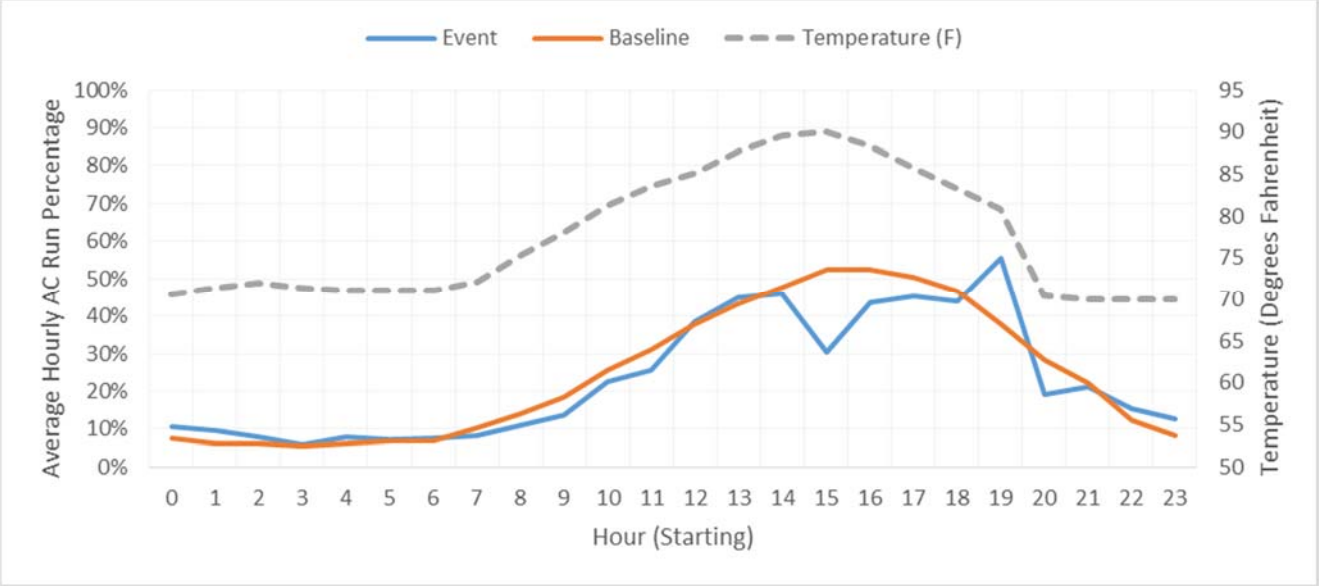


Figure B-24. Central AC Event 18 (Friday, September 9, 2016)



Appendix C. Marketing Effectiveness Survey

Section 5 summarized results from the Marketing Effectiveness Survey conducted with both participants and non-participants in the pilot program. This appendix provides more detailed responses to questions about the pilot's marketing and outreach efforts in 2016.

Awareness of National Grid Energy Efficiency Programs' Funding Source

D0. Before taking this survey, were you aware that energy efficiency programs offered by National Grid are funded through a surcharge on the electric bills of Rhode Island customers? (n=203; Weighted)

1	Yes	40%
2	No	60%

D0a. Does your awareness of this information influence the likelihood that you will participate in any of these programs? (n=203; Weighted)

1	Yes	44%
2	No	56%

Recall of EnergyWise Messaging

[SKIP IF E1=2]

E6. Thinking about the past year, do you recall hearing or seeing any information about the EnergyWise Program?

		EnergyWise Participant (n=122)	EnergyWise Non-Participant (n=57)
1	Yes	88%	75%
2	No	12%	25%

[ASK IF E6=1]

E7. Where did you hear or see information about the EnergyWise Program in the past year? Please select all that apply.

		EnergyWise Participant (n=107)	EnergyWise Non-Participant (n=43)
1	Information in the mail from National Grid	60%	65%
2	Email from National Grid	32%	51%
3	Phone call from National Grid	15%	19%
4	National Grid website	10%	19%
5	Table display at a community event	6%	14%
6	Email from an elected official or other community representative	1%	2%
00	Other: Previous participation	4%	-
00	Other: Word of mouth	1%	2%
00	Other	5%	5%
98	I don't recall where I saw or heard something about the program	11%	7%

Recall of DemandLink Thermostat Program Messaging

[SKIP IF DL1=2]

DL6. Thinking about the past year, do you recall hearing or seeing any information about the DemandLink Program?

		DemandLink Participant (n=43)	DemandLink Non-Participant (n=67)
1	Yes	93%	84%
2	No	7%	16%

[ASK IF DL6=1]

DL7. Where did you hear or see information about the DemandLink Program in the past year? Please select all that apply.

		DemandLink Participant (n=40)	DemandLink Non-Participant (n=56)
1	Information in the mail from National Grid	50%	80%
2	Email from National Grid	33%	38%
3	Phone call from National Grid	5%	4%
00	Other: Current Participant	15%	-
00	Other: Word of mouth	3%	2%
00	Other: Table display at a local event	-	5%
00	Other	-	4%
98	I don't recall where I saw or heard something about the program	10%	5%

Recall of Heat Pump Water Heater Rebate Messaging

[SKIP IF H1=2]

H4. Thinking about the past year, do you recall hearing or seeing anything about the rebate National Grid offers for purchasing a heat pump water heater? (n=72)

1	Yes	72%
2	No	28%

[ASK IF H4=1]

H5. Where did you hear or see information about the rebates in the past year? Please select all that apply. (n=52)

1	Information in the mail from National Grid	64%
2	Email from National Grid	34%
3	Phone call from National Grid	6%
00	Other: Word of mouth	6%
00	Other	2%
98	I don't recall where I saw or heard something about the program	10%

Recall of Rebates for Purchasing or Recycling Window Air Conditioners

[SKIP IF R1a=2 and R1b=2]

R4. Thinking about the past year, do you recall hearing or seeing any information about the rebates National Grid offers for purchasing or recycling window air conditioners? (n=47)

1	Yes	85%
2	No	15%

[ASK IF R4=1]

R5. Where did you hear or see information about the rebates in the past year? Please select all that apply. (n=40)

1	Information in the mail from National Grid	80%
2	Email from National Grid	15%
3	Phone call from National Grid	3%
4	National Grid website	23%
00	Other: Previous participation	5%
98	I don't recall where I saw or heard something about the program	8%

Awareness of "RI Energy Challenge" and "Find Your Four!"

F1. Have you ever heard of "The Rhode Island Energy Challenge"? (n=203; Weighted)

1	Yes	24%
2	No	76%

F2. Have you ever heard the slogan "Find Your Four!"? (n=203; Weighted)

1	Yes	5%
2	No	95%

Recall of Presence at Community Events

F3. This past summer and fall, community volunteers promoted The Rhode Island Energy Challenge, Find Your Four, and the EnergyWise Home Energy Assessment at local organizations and community events throughout Little Compton and Tiverton. These volunteers staffed information tables, similar to the ones shown in the pictures below.

Do you recall seeing any information tables or interacting with the community volunteers? (n=203; Weighted)

1	Yes	10%
2	No	90%

[ASK IF F3=1]

F4. Where did you see the information table? **[OPEN END]** (n=22; Weighted)

1	Church	28%
2	Library	16%
3	Pardon Gray Days	12%
4	Town Fair	14%

98	I don't recall	4%
0	Other, specify	26%

Recall and Clarity of Marketing Materials: Postcard

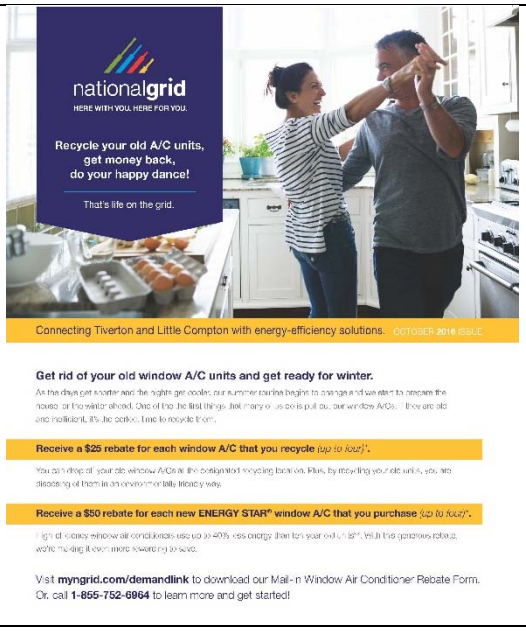
	Postcard – DemandLink Participants (n=14)	Postcard – DemandLink Non-Participants (n=49)
Front		
Back		
P2	How much of the information provided by this image is new to you?	
	1 None 21% 2 Very Little 29% 3 Some 43% 4 Most 7% 5 All 0% 8 Can't see image 0%	1 None 8% 2 Very Little 14% 3 Some 33% 4 Most 26% 5 All 18% 8 Can't see image 0%

	Postcard – DemandLink Participants (n=14)		Postcard – DemandLink Non-Participants (n=49)	
P3	**Based on the information provided on the postcard, to what extent is it clear …**			
	a. what DemandLink is?			
	Not asked of participants.		1 – Not at all clear 2 3 4 5 – Very clear	2% 16% 31% 25% 27%
	b. why someone would want to sign up for the offerings described?			
	1 – Not at all clear 2 3 4 5 – Very clear	0% 7% 7% 29% 57%	1 – Not at all clear 2 3 4 5 – Very clear	2% 10% 20% 39% 29%
	c. how to get more information about the offerings described?			
	1 – Not at all clear 2 3 4 5 – Very clear	0% 14% 7% 36% 43%	1 – Not at all clear 2 3 4 5 – Very clear	2% 8% 25% 31% 35%
	d. that National Grid wants you to check your thermostat to make sure it's connected to your Wi-Fi network?			
	1 – Not at all clear 2 3 4 5 – Very clear	0% 14% 0% 21% 64%	*Not asked of non-participants.*	
	e. why your thermostat needs to be connected to your Wi-Fi network?			
	1 – Not at all clear 2 3 4 5 – Very clear	0% 7% 0% 29% 64%	*Not asked of non-participants.*	
P1	**Do you recall receiving a postcard like this last summer?**			
	1 Yes 2 No	43% 57%	1 Yes 2 No	41% 59%

Recall and Clarity of Marketing Materials: Newsletter

Newsletter – Participants and Non-Participants

Page 1



Page 2

Page 3

	Newsletter –Participant in Any Program (n=49)	Newsletter –Non-Participant in All Programs (n=26)
N2	**How much of the information provided by this image is new to you?**	
	1 None 12% 2 Very Little 14% 3 Some 51% 4 Most 12% 5 All 10% 8 Can't see image 0%	1 None 12% 2 Very Little 4% 3 Some 35% 4 Most 35% 5 All 15% 8 Can't see image 0%
N3	**Based on the information provided on the postcard, to what extent is it clear …**	
	a. what DemandLink is?	
	Asked of DemandLink Non-Participants (n=30) *1 – Not at all clear 0%* *2 3%* *3 33%* *4 27%* *5 – Very clear 36%*	*Asked of DemandLink Non-Participants (n=26)* 1 – Not at all clear 8% 2 4% 3 19% 4 35% 5 – Very clear 35%
	b. why someone would want to sign up for the offerings described?	
	1 – Not at all clear 5% 2 0% 3 5% 4 37% 5 – Very clear 53%	1 – Not at all clear 7% 2 4% 3 30% 4 21% 5 – Very clear 39%
	c. how to get more information about the offerings described?	
	1 – Not at all clear 5% 2 0% 3 11% 4 32% 5 – Very clear 53%	1 – Not at all clear 6% 2 1% 3 19% 4 34% 5 – Very clear 39%
	d. that National Grid wants you to check your thermostat to make sure it's connected to your Wi-Fi network?	
	Asked of DemandLink Participants (n=19) 1 – Not at all clear 5% 2 5% 3 21% 4 32% 5 – Very clear 37%	*Not asked of non-participants.*
	e. why your thermostat needs to be connected to your Wi-Fi network?	
	Asked of DemandLink Participants (n=19) 1 – Not at all clear 5% 2 11% 3 21% 4 21% 5 – Very clear 42%	*Not asked of non-participants.*
	f. that you have to sign up for DemandLink in order to access the water heater rebates?	
	1 – Not at all clear 0% 2 3% 3 23%	1 – Not at all clear 8% 2 12% 3 23%

	Newsletter –Participant in Any Program (n=49)		Newsletter –Non-Participant in All Programs (n=26)	
	4 5 – Very clear	17% 57%	4 5 – Very clear	23% 35%
N1	**Do you recall receiving a postcard like this last summer?**			
	1 Yes 2 No	47% 53%	1 Yes 2 No	42% 58%

Recall and Clarity of Marketing Materials: Email

	Email– DemandLink Participants (n=10)		Email – DemandLink Non-Participants (n=55)	
Front			
EM2	**How much of the information provided by this image is new to you?**			
	1 None 2 Very Little 3 Some 4 Most 5 All 8 Can't see image	10% 10% 30% 30% 20% 0%	1 None 2 Very Little 3 Some 4 Most 5 All 8 Can't see image	13% 9% 33% 15% 31% 0%
EM3	**Based on the information provided on the postcard, to what extent is it clear …**			
	a. what DemandLink is?			
	Not asked of participants.		1 – Not at all clear 2 3 4 5 – Very clear	20% 9% 27% 20% 24%

	Email– DemandLink Participants (n=10)		Email – DemandLink Non-Participants (n=55)	
	b. why someone would want to sign up for the offerings described?			
	1 – Not at all clear	10%	1 – Not at all clear	13%
	2	0%	2	7%
	3	20%	3	26%
	4	40%	4	27%
	5 – Very clear	30%	5 – Very clear	27%
	c. how to get more information about the offerings described?			
	1 – Not at all clear	10%	1 – Not at all clear	13%
	2	0%	2	2%
	3	20%	3	29%
	4	30%	4	22%
	5 – Very clear	40%	5 – Very clear	35%
	f. that you have to sign up for DemandLink in order to access the water heater rebates?			
	Not asked of non-participants.		1 – Not at all clear	15%
			2	4%
			3	26%
			4	22%
			5 – Very clear	35%
EM1	**Do you recall receiving a postcard like this last summer?**			
	1 Yes	0%	1 Yes	20%
	2 No	100%	2 No	80%

Interest in Programs after Reviewing Materials

[ASK IF P1<>8 & N1<>8 & EM1<>8, ELSE SKIP TO NEXT SECTION]

I1. Based on the information in the **[Postcard/Newsletter/Email]**, how likely would you be to visit the website or call to get more information about one or more of the offerings? **[SCALE: 1-5; 1="Not at all likely" 5="Very likely"]**

Postcard (n=63, Weighted)		**Newsletter** (n=75, Weighted)		**Email** (n=65, Weighted)	
1 – Not at all likely	20%	1 – Not at all likely	29%	1 – Not at all likely	19%
2	16%	2	11%	2	12%
3	31%	3	34%	3	29%
4	19%	4	15%	4	31%
5 – Very likely	13%	5 – Very likely	12%	5 – Very likely	9%

[ASK IF I1>2]

I2. Which of the offerings would you be likely to look into or ask about? Please select all that apply. **[MULTIPLE RESPONSE, ROTATE]** *(asked only of non-participants in each offering)*

01	**[SHOW IF EW_PART=0]** EnergyWise Program	(52%, n=54)
02	**[SHOW IF DL_PART=0]** DemandLink	(37%, n=100)
03	Rebate for purchasing a window air conditioner	(24%, n=128)
04	Rebate for recycling a window air conditioner	(29%, n=128)
05	**[SHOW IF HPWH_PART=0]** Rebate for purchasing a heat pump water heater	(50%, n=127)
96	None of these	(20%, n=128)

Appendix D. Survey Sampling and Dispositions

Below we provide details on the survey dispositions and response rates for the online Marketing Effectiveness Survey and the telephone DemandLink Demand Response Event Follow-Up Survey.

The survey response rate is the number of completed interviews divided by the total number of potentially eligible respondents in the sample. We calculated the response rate using the standards and formulas set forth by the American Association for Public Opinion Research (AAPOR). For various reasons, we were unable to determine the eligibility of all sample units through the survey process and chose to use AAPOR Response Rate 3 (RR3). RR3 includes an estimate of eligibility (e) for these unknown sample units. According to AAPOR's standard definitions, we used two estimates of eligibility, which are presented below. The definitions of the letters used in the formulas are displayed in the tables below.

$$e1 = (I + N) / (I + N + X1)$$

$$e2 = (I + N + X1 + U1) / (I + N + X1 + U1 + X2)$$

$$RR = I / (I + N + e1(U1 + e2*U2))$$

Marketing Effectiveness Survey

The sampling unit for the Marketing Effectiveness Survey was the unique substation customer. The population included 4,776 customers identified as unique from the full database of 5,126 substation accounts. We removed 20 contacts identified as businesses and 1,428 contact without email addresses. The final sample frame consisted of 3,328 unique customers. We attempted to complete the survey with all 3,328 participants (census attempt).

Table D-1 shows the final dispositions for the Marketing Effectiveness survey, fielded between March 3, 2017 and March 24, 2017. We completed a total of 203 interviews, resulting in a response rate of 6.8%.

Table D-1. Marketing Effectiveness Survey Dispositions and Response Rate

Result	n
Sample Frame	3,328
I= Complete Interviews	203
X1=Survey-Ineligible Household	8
U1=Household with Undetermined Eligibility	2,817
X2=Not a Household	248
N=Eligible Incomplete Interview	52
U2=Undetermined if Household	0
e1=estimated proportion of cases of unknown survey eligibility that are eligible	0.970
e2=estimated proportion of cases of unknown household eligibility that are eligible	0.925
Response Rate	**6.8%**

Customers who participated in one or more of the five key pilot program components, responded to the survey at a greater rate than they are represented in the population. We created weights for use in our analysis in instances where results for participants and non-participants are combined. These weights are presented in Table D-1Table D-2.

Table D-2. Weights Reflecting Population of Customers Who Participated in Any Program Participants

	Population	Completed Interviews	Weight
Has not participated in any program component	3,651	74	9.847
Has participated in one or more program component	1,125	129	0.168
Total Unique Customers	**4,776**	**203**	–

DemandLink Demand Response Event Follow-Up Survey

The DemandLink Demand Response Event Follow-Up Survey targeted all participants who were enrolled in the DemandLink controllable thermostat component in 2016 (i.e., any residential customer who received a WiFi-enabled thermostat since the beginning of the pilot). The survey was fielded between August 30th and September 1st, following the SRP demand response event called on August 29th.

Table D-3 shows the final dispositions for the survey. We completed a total of 52 interviews, resulting in a response rate of 21.6%.

Table D-3. DemandLink Participant Survey Response Rates

Result	n
Sample Frame	260
I= Complete Interviews	52
X1=Survey-Ineligible Household	0
U1=Household with Undetermined Eligibility	146
X2=Not a Household	16
N=Eligible Incomplete Interview	4
U2=Undetermined if Household	42
e1=estimated proportion of cases of unknown survey eligibility that are eligible	1
e2=estimated proportion of cases of unknown household eligibility that are eligible	0.927
Response Rate	**21.6%**

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APPENDIX 4

Appendix 4 – Projects Screened for NWA

Project ID	Project Description	NWA Comment	Capex Spending Rational	Budget Classification	Program Code	Date Initiated
C072807	RI UG Cable Replacement Program - Fdr 1102	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Project, < $1M in cost	Asset Condition	Asset Replacement	UG Cable Replacements	4/12/2016
C072826	RI UG Cable Replacement Program - Fdr 1104	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Project, < $1M in cost	Asset Condition	Asset Replacement	UG Cable Replacements	4/12/2016
C072847	RI UG Cable Replacement Program - Fdr 1106	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Project, < $1M in cost	Asset Condition	Asset Replacement	UG Cable Replacements	4/12/2016
C074307	RI UG 79F1 Duct Replacement Charles & Orms Sts	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Project, < $1M in cost	Asset Condition	Asset Replacement		6/23/2016
C074426	EMS Expansion - Franklin Sq #11	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Reliability	EMS Expansion	6/28/2016
C074427	EMS Expansion - Phillipsdale 20	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Relay/RTU	EMS Expansion	6/28/2016
C074428	EMS Expansion - Wampanoag 48	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Relay/RTU	EMS Expansion	6/28/2016
C074429	EMS Expansion - Warren #5	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Relay/RTU	EMS Expansion	6/28/2016
C074430	EMS Expansion - Wood River 85	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Reliability	EMS Expansion	6/28/2016
C074431	EMS Expansion - Bonnet 42	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Relay/RTU	EMS Expansion	6/28/2016
C074433	Bristol 51 - EMS Expansion	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Reliability	EMS Expansion	6/28/2016
C074435	EMS Expansion - Centredale 50	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Reliability	EMS Expansion	6/28/2016
C074436	EMS Expansion - Hope 15	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Reliability	EMS Expansion	6/28/2016
C074437	Manton 69 - EMS Expansion	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Reliability	EMS Expansion	6/28/2016
C074438	EMS Expansion - Merton 51	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Substation	EMS Expansion	6/28/2016
C074439	EMS Expansion - Tiverton 2 #33	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Reliability	EMS Expansion	6/28/2016
C074440	EMS Expansion - Warwick Mall 28	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Reliability	EMS Expansion	6/28/2016
C074441	EMS Expansion - West Greenville 45	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Reliability	EMS Expansion	6/28/2016
C074803	37K21/22 Removal, Memorial Drive Newport	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Project	Asset Condition	Asset Replacement		7/22/2016
C074804	Apponaug 23kV Retirements (Distribution Substation)	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Project	Asset Condition	Asset Replacement	Substation Asset Replacement	7/22/2016
C074807	Apponaug 23kV Retirements (Distribution Line)	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Project	Asset Condition	Asset Replacement	Substation Asset Replacement	7/22/2016
C075328	Dyer St Indoor Sub Retirement	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Project	Asset Condition	Asset Replacement		8/23/2016
C075403	Elmwood Indoor Equipment Removal	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Project	Asset Condition	Asset Replacement	Substation Asset Replacement	8/26/2016
C075445	RI Royal Disconnect Replacement Program	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Program	Asset Condition	Asset Replacement		8/30/2016
C075545	Admiral 9 Sub - EMS Expansion	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - EMS Expansion Program	System Capacity & Performance	Reliability		9/7/2016
C075571	RI VVO Langworthy Corner 86, Distribution Line	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Volt-Var Optimization Project	System Capacity & Performance	Reliability		9/8/2016
C075573	RI VVO Langworthy Corner 86, Distribution Substation	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Volt-Var Optimization Project	System Capacity & Performance	Reliability		9/8/2016
C075860	Geneva Sub Equiment Replacement	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Project	Asset Condition	Asset Replacement		9/23/2016
C076202	Dressler S-UG Street Light Replacement	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Project	Asset Condition	Outdoor Lighting - Capital		10/7/2016
C076289	IRURD Pequaw Honk URD RI-Little Compton	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Asset Condition Driven Project	Asset Condition	Asset Replacement		10/13/2016
C076365	RI VVO/CVR Tiogue Ave 100, Distribution Substation	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Volt-Var Optimization Project	System Capacity & Performance	Reliability		10/18/2016
C076367	RI VVO/CVR Lincoln Ave 72, Distribution Substation	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Volt-Var Optimization Project	System Capacity & Performance	Reliability		10/18/2016
C077200	RI VVO/CVR Tiogue Ave 100, Distribution Line	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Volt-Var Optimization Project	System Capacity & Performance	Reliability		1/6/2017
C077201	RI VVO/CVR Lincoln Ave 72, Distribution Line	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - Volt-Var Optimization Project	System Capacity & Performance	Reliability		1/6/2017
C077365	ProvStudy Clarkson St 13F10 Hawkins	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - See Providence Area Study - Implementation Plan, May 2017	Asset Condition	Asset Replacement		2/2/2017
C077368	ProvStudy Retire Olneyville Fdr 6J5	DOES NOT MEET NG NWA SCREENING REQUIREMENTS - See Providence Area Study - Implementation Plan, May 2017	Asset Condition	Asset Replacement		2/2/2017